Ths Bryant 1814
father of Thomas Bryant
both past Presidents
of the Medical Society
of London

A SYLLABUS OF A COURSE OF CHEMICAL LECTURES READ AT GUY's HOSPITAL.

BY

WILLIAM BABINGTON, M.D. F.R.S.
ALEXANDER MARCET, M.D. F.R.S.
PHYSICIANS TO THE HOSPITAL,

AND

WILLIAM ALLEN, F.R.S. & F.L.S.

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PREFACE.

In every Science taught by Lectures, a Syllabus of the Course has been found of advantage to the Student. At the same time that it lays before him a comprehensive outline of the subject, and points out the several divisions and their arrangement with respect to each other, it defines the meaning and extent of scientific terms better than more verbal statements would do, and affords a convenient epitome of the rudiments of the science.

As the objects of Chemistry are various, and its views extensive, so likewise is the connection of its principles subtle, and their investigation complicated and minute: hence the aid of such a synopsis is perhaps even more requisite in this than in any other branch of Natural Philosophy. In proportion too as modern improvements have

enlarged the scope, they have increased the utility of a Prospectus to explain it; if, for instance, we take a retrospective view of the state of Chemical Science eight or ten years ago, it will appear that a number of discoveries have been made since that period, which have opened new fields of investigation, and have in some instances pointed out the imperfection of our former systems.

On these grounds it has been thought right to draw up a Syllabus of the Lectures delivered at this Hospital, and to renew it from time to time, as the progress of the Science may appear to require.

As the Course is necessarily designed for Medical Students, particular attention has been bestowed on those parts which relate to their profession. It is not, however, confined to this object alone. Chemistry is now so intimately connected with various departments of Science, and with most of the Arts and Manufactures whether useful or ornamental, that an acquaintance with it has become in some degree necessary in the general system of education; and however different the views with which the Gentleman, the Artist, and the Manufacturer may enter upon its study, each will obtain informa-

tion adapted to the particular line of his pursuit, that will amply reward him for the time he may spend in acquiring a competent knowledge of its principles.

Agreeably to this view of the matter, an endeavour has been made to point out the application of these principles, not only to the purposes of Medicine, but to most others to which Chemistry is in any way allied; and it is hoped that, independently of advantage during the period of teaching, this Syllabus may be useful to Students when they have ceased to attend;—that by future perusals they may not only recal such information as length of time or diversity of employment had erased from their memories—but that it may also serve as a general outline of the science, to be filled up at their leisure—as a systematic arrangement to which they may refer whatever knowledge they shall hereafter obtain.

In preparing this Course of Lectures, considerable attention has been paid to the order and distribution of the different parts of the subject. But as Chemical Science, though making daily progress, is not yet sufficiently advanced to admit of a perfect arrangement of its parts, and as the new Nomenclature, though admirably

contrived, appears from Professor Davy's late brilliant discoveries, to have in some instances been at variance with facts, it has been deemed desirable in this Course of Lectures to guard against too strict an observance or hasty adoption of systematic views of arrangement. For this reason, the Synoptic Tables of Nomenclature, which appeared in the former Syllabus, are now suppressed; and a list of the Simple Bodies, that is, of those which, in the present state of our chemical knowledge, we are unable to decompose, has been substituted in their place.

It may be proper to mention, that although all subjects strictly belonging to Natural Philosophy are referred to the Lectures delivered at Guy's Hospital on that department of Science, yet the Chemical Lectures are occasionally illustrated by such parts of Experimental Philosophy as the subject may immediately require. By the free access, likewise, to an extensive Laboratory, the Student has an opportunity of seeing the various chemical processes conducted upon a scale corresponding with the expenditure of a large Hospital, and thereby of becoming familiarly acquainted with every step necessary in the management of such operations;—without

which the demonstrations of a Lecture-room will seldom make that impression which is necessary to fix them in his memory, and enable him to apply them with readiness and effect upon any future and distant occasion.

A Lecture on the Chemical Agencies of Electricity, and another upon Mineral Waters, are occasionally delivered during each Session. The examination of the several varieties of Urinary Calculi is also sometimes introduced. But these objects have not been treated of in the Syllabus, as they do not essentially belong to this Course of Lectures, and as their introduction is to be considered as optional.

A

SYLLABUS

OF

CHEMICAL LECTURES.

INTRODUCTION.

General division of the study of Nature, under the heads of *Natural History, Physics,* and *Chemistry.* Objects of these various branches of natural science generally stated. Chemistry defined.

OF THE ATTRACTION OF GRAVITATION.

General view of the subject. Cause of *Attraction* not understood. Different species or modifications of attraction. *Gravitation.*—This force is exerted between masses of matter, and often at an immense distance. Distinction be-

tween the *specific* and *absolute weight* of bodies. *Areometers.* Experimental illustrations on the subject of specific gravity.

OF THE ATTRACTION OF COHESION OR AGGREGATION.

This attraction is exerted between the *homogeneous* particles of bodies, that is, particles of the *same kind,* and acts only in contact, or at imperceptible distances.—Its influence on the different forms of matter.—Differs from *Chemical* attraction. Distinction between the *Integrant* and *Elementary* or *Constituent* particles of bodies. Caloric acts in opposition to the attraction of aggregation.

Crystallization.—Is an effect of the attraction of aggregation. Term *Solution* explained. The formation of crystals, influenced by concentration, refrigeration, rest, atmospheric pressure, &c. and attended with various circumstances, such as change of temperature, of volume, &c. Explanation of the terms *Efflorescence* and *Deliquescence.*—Different susceptibility of crystallization in different salts—how applied to chemical analysis.

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[illegible] (This is an example of [illegible])

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[illegible] the [illegible]

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ink salt

[illegible]

[illegible]

to the atmosphere [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Different Salts give diff[t] proportions [illegible]

be [illegible] them

The formation of Chrystals by Rome de Lisle which [illegible] all Chrys. were derived from certain Primitive or Primitive forms

When you remove the 12 edges of a Cube you make a Chrystal with as many faces as the Number of edges are removed. If we had removed the Solid angles or Corners by which we then [illegible] added 8 faces to the Chrystals

Concise history of *Crystallography*. Sketches of *Romé de L'isle,* and *L'Abbé Haüy's* theories of the formation of crystals. *Primitive* and *secondary* forms of crystals. General idea of *truncations, decrements,* &c. and of the mode in which they give rise to all the varieties of form in crystallized bodies. The form of crystals, and the instrument called *Goniometer,* by means of which these forms are accurately ascertained, are important auxiliaries in mineralogical chemistry.

ON CHEMICAL ATTRACTION.

Chemical attraction or *Affinity,* like the attraction of cohesion, takes place in contact or at insensible distances, but differs from the latter in acting between *dissimilar* or *heterogeneous* particles. The result of its action is the formation of a *compound,* with properties differing from those of its constituent parts. Chemical *Analysis* consists in resolving a compound into its constituent or elementary parts. The attraction of cohesion, and chemical attraction may be generally considered as acting in opposition to each other. Process of *Solution* examined.

In most instances it is necessary, in order that chemical attraction may take place, that one of the constituents should be in the fluid state. Chemical combination produces remarkable changes in the form, colour, density, &c. of the bodies combined, and is generally attended with a change of temperature.

Bodies have amongst themselves different degrees of chemical attraction, and it is on the estimation of these different attractive forces that the Science of Chemistry rests.—Methods employed to form such estimates.

Definition of the terms *Simple* and *Double elective attraction.*—Experimental illustrations.—*Precipitation.*—*Saturation.*

Berthollet's opinions on the doctrine of attraction generally stated. The quantities or masses of matter—the force of attraction of aggregation—the degree of temperature—considered as causes by which the phenomena of attraction are often modified.

Of the *limits* of chemical attraction.—Whether bodies can combine together in any proportion; or whether they will unite only in certain determinate proportions?—Concise view of Mr. Dalton's and Dr. Wollaston's theories on the subject.

Chemical Attraction.

[illegible]

[illegible] attraction of Cohesion [illegible]

[illegible]

[illegible] of chemical attraction is that the
nature of one of the articles is completely
altered as for Sulphuric Acid & Copper
from Sulphate of Copper, the [illegible]
Alkali with oil [illegible] by its combination as Soap
differed in every respect from the 2 ingredients
[illegible]

Among the [illegible] of chemical attraction
there is [illegible] a complete change of
form [illegible] Muriate of Lime (& Sulphuric Acid)
[illegible]
[illegible]
into a Salt forming Sulphate of Lime
[illegible]

[illegible] of this is also [illegible] the
[illegible] by [illegible] Nitric Acid [illegible]
[illegible] together [illegible] produce a flame
[illegible] of [illegible]
[illegible]
[illegible] Combination of Carbonic Acid gas & Ammonia
[illegible] produce Carbonate of Ammonia
[illegible] gas forming a Solid
[illegible]
Muriate of Ammonia.

Chemical Comb. is always attended with a change of Density

By this [illegible] the Tube is put [illegible] the water [illegible] a [illegible] of [illegible] that all difference is a distinct [illegible]

The same happens when different [illegible] [illegible] [illegible] heat [illegible] [illegible] of chemical Comb. There is a change of temperature [illegible] degree of heat [illegible] the [illegible] of [illegible] Carbonic Acid: Nitrous [illegible] greater [illegible] [illegible] at Temp.

Black [illegible] from which [illegible] It is very disposed to [illegible] Lime absorbs Carbonic Acid very readily but [illegible] it again

If you add Sulphuric [illegible] to [illegible] of Lime which has a greater attraction for the Lime than the Carbonic Acid, it will [illegible] to the Bottom of the [illegible] forming Gypsum or Sulphate of Lime, [illegible] of Carbonic [illegible] —

There is a Lord's [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] of the [illegible] of [illegible] in Presidency of
[illegible] for example

[illegible]

CLASSIFICATION.

The principles of classification of the older chemists shown to be inconsistent with modern discoveries.—What is to be understood by the term *Element*, or *Elementary Substance*.

General view of the *simple* or *elementary bodies*. Of the principles of arrangement adopted in most modern treatises of Chemistry. Unavoidable difficulties in a systematic classification of chemical knowledge. Statement of the arrangement adopted in this course—reasons which appear to render it most eligible.

OF CALORIC.

Explanation of the terms *Heat* and *Caloric*. Various opinions on the nature of Caloric examined.—Its phenomena may be considered under two general heads, *viz.*

I.—FREE CALORIC, OR HEAT OF TEMPERATURE.

Caloric, in this state, *expands* bodies, and affects the thermometer.—*Equilibrium* of heat.—*Thermometer*.—Principle and construction of that instrument. Description of the various thermometrical scales. Nature and limits of the information

derived from these instruments.—Wedgwood's *Pyrometer*.—Peculiarity respecting the expansion of elastic fluids by heat.—Exceptions to the law of expansion by heat.—Expansive force of freezing water.—Contraction of Argil by heat.—*Fusion* and *Vaporization* of bodies.—*Evaporation*, distinguished from *vaporization*.—Influence of the atmospheric pressure on vaporization.

Theory of the *Propagation* and *Equilibrium* of free caloric.—*Conducting powers* of bodies.—Fluids are very slow conductors when at rest.

Radiation of heat.—Professor Prevost's theory of universal radiation.—*Reflexion* of heat.—Professor Pictet's apparent reflexion of cold.—Leslie's *differential thermometer*.—Bodies differ in their *reflecting, radiating,* and *absorbing* powers.—Explanations and experimental illustrations.—Practical applications of these principles.—*Ignition* is the ultimate effect of accumulated caloric in its free state.—Takes place in all bodies nearly at the same temperature.

II.—COMBINED CALORIC.

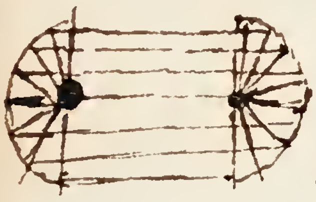
Caloric, when combined with bodies, may be considered in two points of view:

1st. As *Specific or Comparative heat*.—Meaning of these terms defined and illustrated by

* If a quantity of water be gradually cooled down to a certain Temperature, and if that is carried still farther it will expand & if y vessel is closed it will often burst it, the force of water when it is freezing is extreme it often splits off peices of rocks and Slate, Trees &c. Clay cracks when heat is applied to this is owing to y moisture of it being taken away.
It may be said generally that all bodies excepting Vegetable produc are fusible. When a body is rendered fluid.
the point of boiling water is 212, Æther 104 Hydrarg: 170 by Farenheit's Thermometer, When water approaches y boiling point a Noise is heard this is owing to y agitation of y water; then Steam arises thro' y mass of water which comes out of y Vessel in a visible state, Water in high situations, as on the top a Mountain &c, will boil at an inferi temperature when it is deprived of Atmospheric pressure. If you cork up a flask of water, when the water is boiling, you take away y Atmospherical pressure, then by immersing the flask of water after it has stopt boiling, into a vessel of Cold water ebullition will again Commence, Glass is y best Conductor of heat Copper Next, silver is y best Conduc of heat Gold &c &c. Bodies differ very much in absorbing heat. thus some things feel Cold, others warm. they are bad & good Conductors. On the reappearance of frost, that when it thaws we feel it much Colder this is owing to y wet air being a good Conductor of heat. Cor...

Fluids are very slow Conductors of heat when at rest; this was supposed by Humphrey. they have, it is now known a very slight Conducting power. this is easily seen by placing a Thermometer in a vessel of water, & pouring ether on its surface & igniting it & you will not find this water become of a higher temperature & raise the thermometer.

According to Dr Prevost's Caloric Consists of various particles. That Caloric radiates in right lines and observes of the same laws as light. The rays of Caloric can be brought into a focus When a hot body is placed in the Centre of a Concave body the rays are diverging towards that Concave body. & by the same law the rays are directed in a parallel directions,



By placing a bottle of hot water in this way we can raise the Column of the Thermometer very much: but by placing a body of greater heat (as a red hot bullet) we can ignite Gunpowder. after the Gunpowder has exploded you will find by applying your hand to the surface of the opposite mirror it will be very hot indeed. Cold is capable of being reflected by a like experiment but in this the Thermometer is becoming the hot body Various Bodies have diff: powers in radiating & reflecting the rays of heat. if a body was blackened it would radiate more, but reflect less. Bright & Mettallic surfaces reflects most, but radiates less. a Paper Surface The reason why Metallic pots makes better tea than an earthen one, is because it radiates less. Polished Metallic Substances.

Combined Caloric 1st Different bodies have a different Capacity for Caloric - a diminished Capacity of heat in Conseque of Condensation will ignite tinder

If Ice be melted & a Thermometer be placed in it, you will find the Thermometer remain in the same State, this is owing to the heat being entirely employed in changing the Ice to a fluid State. but directly it is all melted of course y Thermometer will rise, The diff: of latent & Specific Caloric is that y latter is

Latent heat requires a change of State; it undergoes a Change: hence it is called heat of fluidity or evaporization, the Phenomena of latent heat was found by Dr Black *, he found it by filling a Vial with Water, Corked; boiled it, which soon ceased boiling from y pressure of the air in y Vial, the cause, was that y vapor, coud not be carried off, it was raised above the boiling point, the Cork was suddenly withdrawn, instead of the water rushing out: it fell back to y boiling point by the steam escaping.

1 ℥i of water in y form of Steam contains more heat than f℥i of water at the boiling point (212 deg:)

Alcohol of Sulphur is better than Ather for producing evaporation, but evaporation will go on without the aid of these evaporating fluids. Water will actually freeze by its own Evaporation & much sooner in a potters Vessel that being porous.

If we take a tube, with a bulb at each extremity & let that tube be exhausted of all the air, then wrap round one of the bulbs with Lint soaked with Ather or Alcohol of Sulphur, the water which is in the bulb will freeze

experiments.—*Capacity* of bodies for caloric.—Changes of temperature produced by the condensation or rarefaction of elastic fluids.—Bodies ignited by the mere condensation of air.

2dly. In the state of *Latent heat,* also called *Heat of fluidity.*—Is that which is absorbed by bodies during their fusion or volatilization.—Account of some of Dr. Black's original experiments on the subject.—Experimental illustrations.—Cold produced by evaporation.—Cold produced by the solution of salts.—Heat evolved during the crystallization of salts.—Lavoisier's *Calorimeter.*—Application of the doctrine of latent heat to a variety of natural phenomena and artificial processes.

Of *Steam* in particular.—Distinction between *Vapour* and *Gas.*—Estimate of the elastic force of vapour.—Temperature of steam raised by increase of pressure.—*Eolipile.*—Papin's digester.—Application of steam to mechanical purposes.—Chemical history of the *Steam-Engine.*

Processes of *Distillation—Sublimation—Evaporation—Spontaneous evaporation—Hygrometer.*

Whether heat may be considered as existing in bodies in a state of *Chemical combination,* forming a third modification of combined caloric?

The extrication of heat by *friction* and *percussion,* not distinctly referable to any of the other modifications of caloric.

OF LIGHT.

Connexion between caloric and *Light.*—Nature of light.—Its *reflexion* and *refraction.*—Its *decomposition* into seven coloured rays.—These rays differ in their power of producing light.—They differ also in their power of producing heat.

Property of certain bodies to absorb light.—*Phosphorescence.*—Bolognian stone.—Canton's phosphorus.—Animal phosphorescent substances.—Luminous fish.—Glow-worm.—Lantern fly.—Rotten wood.

Connexion of *Light* with *Oxygen.*—*De-oxydating* effects of light.—Its effects on nitrat and muriat of silver.—Mr. Wedgwood's contrivance for copying paintings on glass.—Effects of light on the animal and vegetable economy.—Rays of light, which, though not discernible, produce chemical effects.

General considerations on the effects of HEAT and LIGHT in nature.

Mercury does not freeze until it reaches 39 degrees below Zero of Farenheit's Thermometer.

Soda Sulphas: 8 parts Nitre 5 P. Ammoniac Sal 5 parts this produces an intense Cold this produces a temperature of Zero. Nitrate of Ammonia produces a great deg: of Cold when dissolved in water The Acids Diluted mixt with Snow produce a great degree of Cold a Temperature of 15 below Zero. If you fill a Phial with a solution of Soda Sulphas & exclude the air from it by corking it Closely, when you take out the Cork & expose the Surface to the atmosphere you will see it will suddenly Chrystallize.

OF AERIFORM SUBSTANCES OR GASSES.

These consist of a solid ponderable substance or *Base* combined in a peculiar manner with *Caloric.*

The property of the resulting gas depends upon the nature of its *Base.*

Those not condensable at common temperatures, distinguished by the name of *Permanently elastic Fluids.*

Method of ascertaining the *absolute* and *specific Gravity* of gasses, and computing their volume under different circumstances of *Pressure* and *Rarefaction.*

Elasticity of the air.—Theory of the *Air-Pump.*

Of Oxygen Gas.

Called formerly *Dephlogisticated, Pure, Empyreal,* or *Vital Air.*

Somewhat heavier than *Common Air.*—100 cubical inches at the temp. of 60 *Farenh.* and at 30 inches *Bar. press.* weigh about 33,8 grains.

Forms a constituent part of the *Atmosphere*—Serves the purposes of *Respiration* and *Combustion* in an eminent degree—Has a powerful affinity with a great variety of substances, particularly inflammable bodies, and when the new compounds are rapidly formed, *Caloric* and *Light* are frequently elicited.

Theory of *Combustion*—*Pyrophorus.*

To *Sulphur, Phosphorus,* and *Charcoal,* in the act of burning, it communicates *acid* properties; which are more or less distinct, as the combustion or decomposition of the Gas has been more or less complete.

The basis, therefore, of this fluid was formerly considered as the universally *Acidifying Principle,* and hence denominated *Oxygen*:—hence also the terms *Oxyd, Oxydation, Oxygenation,* &c.

The base of *Oxygen Gas* has a strong attraction for *Caloric,* but this is overcome or modified by the attraction of the particles of some solid substances.

It destroys the splendour and tenacity of the *Metallic Bodies* when they are exposed to it at a high temperature, and gives them an increase of weight proportioned to its own consumption: hence the modern theory of *Calcination.*

Oxygen combines in diff^t proportions

[illegible] [illegible] must more oxygen than [illegible].

If [illegible] [illegible] it attracts Oxygen [illegible] [illegible]
[illegible] [illegible] [illegible] it therefore [illegible] [illegible] [illegible]
the process of oxydation

[illegible] [illegible] have a feeble attraction for oxygen [illegible]
[illegible] they retain them [illegible] a long time [illegible] exposed to [illegible]
[illegible]

If the oxyde of metals are heated with Charcoal [illegible]
[illegible] [illegible] the metal

If [illegible] [illegible] is heated in a retort containing [illegible]
[illegible] first [illegible] [illegible] then oxygen and if [illegible]
[illegible] [illegible] afterward you [illegible] [illegible] [illegible]

The process of [illegible] [illegible] by [illegible] of [illegible] [illegible]
[illegible] [illegible] [illegible] discovered the effect it produced [illegible]
[illegible] [illegible] he thought that [illegible] [illegible] [illegible]
[illegible] [illegible] respiration - Priestly worked on this [illegible]
[illegible] [illegible] he found that an animal [illegible] only live a
certain time in a certain quantity of air - [illegible] that
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] which [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] without [illegible] [illegible]
[illegible] [illegible] of that [illegible] the [illegible] [illegible] [illegible]
with safety [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] by making [illegible] [illegible] [illegible] Oxygen
[illegible] [illegible] not support life [illegible] [illegible] [illegible] [illegible]
[illegible] Priestly [illegible] that the difference of [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] by the action of the Oxygen
[illegible] [illegible] [illegible] [illegible] to the atmosphere [illegible]
oxygen [illegible] [illegible] [illegible] [illegible] blood [illegible] [illegible]
[illegible] blood [illegible] the Oxygen [illegible] [illegible] [illegible]

[illegible]

[illegible] Oxygen [illegible]

[illegible] found they had [illegible] Carbonic Acid

[illegible] the Oxygen [illegible] the quantity of Oxygen [illegible]

[illegible] Oxygen [illegible] Carbonic Acid [illegible]

[illegible] Hydrogen & Oxygen [illegible]

[illegible] Prof. Müller [illegible] Carbonic [illegible]

[illegible] Oxygen [illegible]

[illegible]

[illegible] Oxygen [illegible]

The [illegible] of Oxygen [illegible]

[illegible] the [illegible]

[illegible] quantity of Carbonic [illegible]

[illegible]

[illegible]

[illegible]

Protoxyd—the first degree of *Oxygenation.*

Peroxyd—the highest degree.

Importance of *Oxygen Gas* in the process of *Respiration*—Analogy between this process and *Combustion.* — *Carbonic Acid* the result; — for every cubic inch of *Carbonic Acid* formed, there is a loss of a cubic inch of *Oxygen* in the air respired. — Produces a remarkable change in *Blood:* hence the supposed function of the *Lungs,* and origin of *Animal Heat.*

Its purity best ascertained by exposure to a solution of *green Sulphate* or *Muriate of Iron* saturated with *Nitrous Gas,* or by mixture with the Gas itself: *Eudiometer.*

Obtained most readily from *Metallic Oxyds,* and compounds of the *Nitric* and other acids by the application of heat, and in a state of great purity from *Oxymuriate of Potash.*

Of Azote or Nitrogen Gas.

Called formerly *Phlogisticated Air,* and *Mofete.*

Remains after the abstraction of *Oxygen Gas* from *Atmospherical Air,* by exposure of the latter to *Sulphuret of Potash,* to a mixture of *Iron Filings* and *Sulphur,* &c.

Obtained also by mixing *Oxymuriatic Acid* with *Ammoniacal Gas.*

When pure has a faint smell, but no taste, and is rather lighter than *Atmospherical Air.*

100 cubical inches, *Therm.* 60° *Bar.* 30° weigh about 30, 4 grs.

If inspired is instantaneously destructive of *Animal Life,* and extinguishes *Flame*; but does not impede *Vegetation.*

Differs from most other *Gases* in being but in a small degree capable of absorption by *Water,* or by the liquid forms either of *Acids* or *Alkalies.*

Evolved in the decomposition of *Animal* and *Vegetable Substances,* of which it forms a constituent part.

When mixed in a certain proportion with *Oxygen Gas* and exposed to the *Electrical Spark,* it produces *Nitric Acid*; and by union with *Hydrogen Gas* it forms *Ammonia*—from the former of these properties it takes the name of *Nitrogen.*

Of the means thought to be employed by nature to maintain a due proportion between this and *Oxygen Gas* in the composition of the *Atmosphere.*

[illegible] tried by experiments how much he could [illegible]
Oxygen etc. he tried some [illegible] in gas [illegible]
[illegible] and found 7/8ths of Oxygen
[illegible] Combustion without Oxygen if you take the Oxygen
[illegible] water by distilling it and [illegible]
[illegible] as in the water [illegible]
[illegible]

[illegible] Carbon, and gas is always formed in respiration
[illegible] constantly accompanying Carbonic acid
[illegible] of Oxygen exposed to light

The Conferva [illegible] could be of examined
with Microscope is a most beautiful object

To Obtain Oxygen

The Cheapest the Red Oxyde of Manganese [illegible]
[illegible] heat and apply [illegible] heat
Oz. will yield 4 Gallons of Gas.
By [illegible] Manganese or Nitre and [illegible]
[illegible] of Manganese.
The Nitrate of Potash will yield in [illegible],
[illegible] its own bulk of gas.
The purest Oxygen Gas is got from [illegible] of Potash
[illegible] of Potash will yield [illegible] Cubic Inches of
[illegible] Oxygen. When getting it for delicate exp.
[illegible] necessary [illegible]
[illegible] should be conducted slowly

Oxygen Gas [illegible] Constantly [illegible]
[illegible]
[illegible]
[illegible]

at 212 Water is attracted by heat takes the form of Steam

Water can only be got pure by distilling it in a glass retort & then very slowly almost be able to tell the drops in

Water contains differt substances

Water in a slight degree compressible

The decomposing glass of made into a State of vapour and applied to its

Hydrogen has a strong attraction for Lime & [illegible] ...sphere and some of [illegible] by throwing in Lime

Of Hydrogen Gas, or Inflammable Air.

Found in a disengaged and impure state in *Coal Mines,* on the surface of *Stagnant Waters,* and rising through the waters of certain *Springs.*

Obtained also artificially from *animal, vegetable,* and *bituminous* matter by distillation; from *Essential Oils, Alcohol, Æthers,* &c. by the application of heat; and from *Ammoniacal Gas* by means of the *Electric Spark.*

But purest from the decomposition of *Water* by *Metals,* as above stated; or during their solution in *diluted Acids.*

When pure, between 11 and 12 times lighter than *Atmospherical Air:* hence the construction of *Aêrostatic Machines.*

Smell adventitious.

100 cubical inches at a Temp: 60 *Farenht.* and 30 inches *Bar. press.* weigh 2. 8 grs.

Combined with *Oxygen* in the proportion of about 15 *Hydrogen* to 85 *Oxygen* by weight, it forms water, from the decomposition of which these fluids may be both obtained in a gaseous state, and therefore considered as its elements.

Hence the effects of *Water* in promoting *Combustion,* and in the *Oxydation* of *Metals,* &c. &c.

In the combustion of *Hydrogen* with *Oxygen Gas,* the purity of the resulting water depends on the slowness or rapidity with which the process is conducted.

On inspiration proves noxious to *Animal life,* apparently by the exclusion of the *respirable* part of the *Atmosphere.*

In its nascent state it is found to be capable of combining both with *Oxygen* and *Azote,* with the one producing *Water* as in the case of combustion, and with the other *Ammonia.*

Carburetted Hydrogen Gas—formerly called, *Heavy Inflammable Air*—procured by passing *Hydrogen Gas* over red hot *Charcoal*—afforded by subjecting *vegetables* and *Inflammable Substances* to a strong heat—different kinds of *Carburetted Hydrogen—Olefiant Gas—Gas Lights.*

Sulphuretted Hydrogen Gas—Methods of procuring—Combines with *Alkaline Bases*—Is absorbed by water—The solution precipitates some metals and not others.

Phosphuretted Hydrogen Gas—One of the most combustible substances known—Absorbable by water—Methods of procuring.

Hydrogen Gas is capable of holding *Arsenic* in solution.

ater may be decomposed by a Common Electrical
achine Take a Tube filled with water Cork its at
th ends & put a small gold wire thro' it letting the
communicate with an Electrical machine
we employ a Zinc wire from its strong attraction
oxygen the water will become muddy.—
ter may be completely decomposed by making
Steam pass thro' a red hot Tube . . in which
ter there is piece of iron wire which attracts
Oxygen & the Hydrogen passes over & may be
lamed.

The inconvenience arising from Gas lights in a room
for it is not only unpleasant but unwholesome—
Hydrogen will take up Sulphur forming Sulphu
retted Hydrogen gas To procure this pour a small
quantity of diluted Muriatic Acid on a small
portion of Sulphurated Potash it is Sulphureted
Hydrogen which is so offensive in Common Sewers
ditches &c it is very volatile The bad smell of Sewers
&c Mr Allen says may be abated by Quick Lime
Phosphorus Combined with Hyd: forming Phospho
-retted Hydrogen Gas it is made by putting a
piece of Phosphorus in Hydrogen gas directly
this Gas is exposed to Oxygen it becomes
a Compound of Phosphorus & Lime when put
in the Water it will take fire

Hydrogen can hold a portion of Arsenic in it, it is produced by pouring on Zinc

Nitrous Oxyd Gas can't be respired longer than four Minutes without losing entirely voluntary Motion. Some persons after taking it are remarkably grave & sullen. Some are very lively and in fact almost deranged

Inflammable Substances require a higher temperature to burn in this Gas than in Hydrogen a Piece of Sulphur must be heated some time before it will burn it the Nitrous Oxyd Gas.

To procure this Gas take Nitrate of Ammonia which consists of Ammonia (Composed of Hydrogen and Azote) Nitric acid (Composed of Azote & Oxygen) the result will be by distilling the Salt we shall have

Phosphorus will readily decompose this Gas and burn most splendidly.

Of Nitrous Oxyd Gas.

Procured from the decomposition of *Nitrate of Ammonia* with a gentle heat. Consists of *Oxygen* and *Azote* in intimate union. In some of its properties resembles *Acids.*

100 cubical inches at a middle temperature and pressure, weigh about 50 grains—Is decomposed by combustible substances at a very high temperature—Soluble in double its volume of *Water,* to which it communicates a sweetish taste.

Most inflammable substances require a high temperature to burn in it—Is not acted upon by *Nitrous Gas.*

Remarkable for the intoxicating effects which it produces in respiration.

OF SALTS.

These characterized by being *sapid* or of a *saline taste* and readily *soluble* in water; further remarkable for their disposition to act on, or to be acted upon by most other substances, as also for the regularity of the forms which they are in most instances found capable of assuming—*Crystallization.*

Their solution in water for the most part accompanied by a diminution of temperature; hence the usual means of producing *artificial Cold.*

On exposure to air generally either receive or impart moisture: hence said to be *deliquescent* or *efflorescent.*

When heated, the greater number undergo either *watery* or *igneous Fusion*—some are volatalized, and many more or less completely decomposed.

They are divided into *simple* and *compounded*—the more simple are *Alkalies* and *Acids*—the compounded, such as result from the union of these with each other, *Neutral Salts,*—or of the acids with earths and metallic oxyds, *Earthy* and *Metallic Salts.*

In some Salt there is a great portion of Water
In Alum there is a very large portion of Water
In Sal Rochelle there is also a large portion
of water

The particles of a Saline body having a dispos-
-tion to attract each other they enable us to
purify this Salt
If we have a Solution of a Saline substance all
we have to do is to apply heat to evaporate the water
when on suffering it to cool Chrystals will form
If you evaporate to much of the water the Chrystals
will be irregular the appearance of a Pellicle is
a sign that Chrystalls will form. when the tempe-
rature of the Solution, is down to the Tempera-
ture of the laboratory you will know that the
process of Chrystallization is finished. In
the Vessel it is situated place pieces of Stick
across the Vessels for the Chrystalls to form
in. If the Chrystalls are Colored you have
only to dissolve these Chrystalls again in Water
and evaporate it again when you will obtain
clear Chrystalls. Chrystallization also affords
us an opportunity of separating different Salts
which are not readily soluble in Water, by evapo-
rating it cautiously you will easily separate
them. - The Most soluble will Chrystallize first

We can make Salts Chrystallize directly on applying some Substance which has strong Attraction for Water. Take a Solution of Sulphate of Potash & pour a little Alcohol into it when a precipitation of Chrystales will take place.

Some Salts some Salts will alter the chrystallized form, by being exposed to the Air the Sulphate of Potash will effloress. Caustic Potash will Liquify...

Some Salts may be Sublimed. Some Salts are decomposed by heat: Saline Substances form 2 grand Divisions Simple & Compound

We have   earthy Salts, & Metallic Salts.

To know an Alkaline Solution take a piece of Paper which has been dipt in Turmeric . it will Change its Color Syrup of Violets will change it green – The different Alkalies have no action on each other . They have a Strong attraction for Moisture . A good test for Alkalies is a bit of Litmus paper reddened by Vinegar if it be dipt in that State into an Alkaline Solution it will recover its blue Color Alkalies in their pure State Combine with Oils by forming Soaps

The Alkalies have a Peculiar effect on Animal Matter therefore they are Called Caustics When Combined with Acids this power is destroyed. The term till lately was confined to these 3 Substances Potash, Soda & Ammonia but it is now found to be in many other Substances,

OF ALKALIES.

Distinguished by a pungent, and lixivial or urinous *Taste,* and by changing most vegetable *blue* colours to *green,* and many of the vegetable *yellow* colours to *brown.*

Have a strong attraction for *moisture.*

Produce no alteration on each other, but manifest an extensive disposition to unite with other bodies. With *Acids* they constitute *Neutral Salts.*

They precipitate from their solutions most of the *Earths,* and all the *Metallic Oxyds,* several of which they are capable of re-dissolving.

With *unctuous substances* they form *Soaps;* with *Silex* and *Alumine* various kinds of *Glass* and *Porcelain;* with *Sulphur, Alkaline Hepars* or *Sulphurets.*

The substances most perfectly *Alkaline* are *Potash, Soda,* and *Ammonia.*

The two former, till lately considered as simple bodies, but discovered by Professor Davy to consist of peculiar *Metallic Bases* combined with *Oxygen.*

Ammonia remarkable for its volatility in a moderate temperature—a compound of *Hydrogen* and *Azote.*

Many of the *Earths* also have distinct alkaline properties, more especially *Barytes, Strontian* and *Lime.*

Of Potash.

Form, *concrete.* Taste, *extremely pungent, Caustic.* Colour, *white.* When perfectly dry, is a non-conductor of *Electricity.* In this state consists, according to the experiments of Professor Davy, of a peculiar metal *Potassium*—combined with *Oxygen* and a portion of *Water* intimately combined.

Potassium is considerably lighter than *Water*—rapidly absorbs *Oxygen*—is capable of two states of oxidation, *Protoxyd* and *Peroxyd*—exists in the latter state in *Potash*—is soluble in *Hydrogen Gas*—combines with inflammable substances—and forms alloys with metals.

Potash appears to be a constituent part of most *vegetable* substances; it is also found to enter into the composition of several *minerals.* Usually obtained from the ashes of the former in the state of *common Potash,* by elixation in water and evaporation to dryness; or in that of *pure Potash* by subsequent treatment with *Lime.*

Potash is a part of most vegetable & mostly mineral bodies it acts in its pure state as a Caustic on the addition of moisture to it heat is evolved: Alters vegetable blues to green.

exposed to a strong heat it melts & may be poured into moulds. Its powers on Substances depends

It is procured from all vegetables by combustion & putrefaction. In very woody Countries trees are Cut down to make potash the wood is burnt. the Ashes of it contain potash by pouring water on these you procure a strong Solution of Potash this is evaporated & which forms Potash. In the boughs of the tree & small succulent twigs there is the greatest share of Potash.

Many of the weeds in England have Potash in it Common Fern; Fumitory &c

will yeild Potash by burning. Wormwood will also yeild Potash by the same Process Pearl Ash is the Common Potash purifyed by breaking it into small pieces exposed to heat & the Salt is made red hot .. The Oxygen of the Air takes away the Carbon Hydrogen .. and the Substance becomes white forming the Pearl Ash.

In order to obtain Potash pure Take Pearl Ash at 3 & 4 lbs of Quick lime add to them 3 or 4 times their weight of Water Chalk would be formed

We should have a Solution of Caustic Potash this Solution being evaporated in a Clean iron vessel will form the Common Caustic Potash - It is purified by adding Alkohol which has only the property of destroying the Caustic Potash.

The Oxides of Some Metals are Soluble in Potash the Oxide of tin is Soluble Oxide of Iron is not.

It has the Power of acting on flint &c it will render them Soluble in Water .-

etalic Potash was thought an elementary
ubstance, not being able to decompose
t. But Mr Davy decomposed it by the
oltaic Battery — Potassium is a Metal
t will amalgamate with other Metals
alloy it will when put into water decom-
pose it and render it Alkaline which may
e known by dipping a piece of Turmeric
aper into it

00 of Dried Potash Contain

ydrogen Gas may be produced by putting a piece
f Potassium into it — It is Capable of 3 States of
xydation The Suboxydate which is made by
utting a small piece of Potassium & expose to the
ir from which it will absorb oxygen 2nd form
Deuoxyde — 3 Peroxyde which is yellow
otassium has a very powerfull attraction for Oxygen
ut a small bit of Potassium into a retort
xhaust by the Air Pump successively and put
nto the retort some Oxygen which is heated by a
amp of Spirit, by this means you will obtain
e Poroxyde of Potassium from which Comes
Contact with Potassium will become an alloy &
ll look like Tin

Potassium has no action on Nitrate of Potash

Potassium will decompose Glass
When heated in Hydrogen it forms an
Hydruret

Has a strong attraction for *moisture.*

On solution in *Water* produces an increase of temperature (*Liquor Potassæ* P.L.)

Combines with all the *Acids,* and in most instances with a force of attraction superior to that of any other substance.

Fusible in a moderate, and volatile in an intense heat. Is decomposed in a high temperature by *Iron.*

Promotes the fusion of *earthy Bodies* and of *metallic Oxyds*; hence the preparation of different kinds of *Glass.* Unites with *Sulphur,* and renders it soluble in water (*Potassæ Sulphuratum* P. L.)

Dissolves several of the *Metallic Oxyds.* The comparative forces of attraction under all circumstances by no means exactly ascertained.

The order of the attraction of this alkali, in the moist way, *Sulphuric, Nitric, Muriatic, Phosphoric, Fluoric, Oxalic, Tartaric, Arsenic, Succinic, Citric, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic and Prussic Acid*; *Water, Unctuous Oils, Sulphur, Metallic Oxyds*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Nitric, Muriatic, Fluoric, Succinic, Formic, Lactic, Benzoic,* and *Acetic Acid, Baryt, Lime, Magnesia, Alumine, Silica, Sulphur.*

Sometimes prescribed internally in solution; in the concrete form frequently employed as a *Caustic.*

Of Soda.

Its *Form, Colour, Taste, Causticity,* &c. nearly the same with those of the former *Alkali.*

Consists, according to Professor Davy, of a peculiar *metallic Base* called *Sodium,* combined with *Oxygen.*

Sodium lighter than water, but heavier than *Potassium.* Other particulars in which these two metals differ.

Found in great abundance in the mineral kingdom, particularly in combination with *Muriatic Acid.*—Obtained, in a pure or caustic form, from *Carbonate* of *Soda,* by means of *Lime,* as pure or caustic *Potash* is from *Carbonate of Potash.*

Soda has an equally extensive disposition to combine with *Acids* as *Potash.*

Acts powerfully on the *Earths,* and *metallic Oxyds*; also unites readily with *unctuous substances*; hence the preparations of *common Soaps.*

Order of attraction of this Alkali, the same as that of *Potash.*

It is impossible to distinguish this from the
[illegible]ast alkali from its external appearances
[illegible] will turn veget: blues green.
[illegible] can only be d from Potash by its
[illegible]mical Combinations. It has a stronger
[illegible]traction for Acids than ~~Sod~~ Potassium
[illegible] Oxymuriate of Platina does not occasion
[illegible] precipitation in a Solution of Soda but
[illegible] does in a Solution of Potass.. Soda like
[illegible]tass appears to Solidify a portion of water
[illegible] raises the thermometer Soda has been
[illegible]lled fossil or mineral Alkali it is diff.
[illegible] find an animal or veget: Substance without a
[illegible]rtion of Soda. It is procured by Burning
[illegible]arine Plants. which is annual it grows in
[illegible] Mediterranean. It is melted into a set of
[illegible]rge Masses which is called Barilla then
[illegible] Soda Subcarb: in this last Substance
[illegible]t which comes from Spain is best
[illegible]p is obtained by burning Marine plants
[illegible] generally has but a small portion of
[illegible]kali. 101 Grains of Acid will Saturate 50
[illegible]ins of Barilla It is used in Manufacture
[illegible]t it does not contain as much
[illegible]

[illegible]

Soda is never found pure; It is found in Egypt & on the Shore &c [illegible]

Various Processes have been made to obtain it from Common Salt. To obtain it take Sod: Subcarb: Ct 4 ad Ct 2 of Quick lime 2 Gallons of Water Lime takes the Carb: Acid. we have a Solution of Caustic Soda which being boiled down when it is evaporated in the Same Manner as you would other Saline Substances it may be purifyed by Alcohol —

It decomposes Water & gives off Hydrogen Gas exactly as Potassium does.

It Chemical Properties are much the Same as those of the Potassium, last Mentioned

It is capable of 3 States Suboxyde. 2nd Deuoxyde 3rd State the peroxyde. —

25 Oz of 75 Iodine in 100 Parts of So[illegible]

[illegible]pable of 2 States of Oxydation.

[illegible]toxide & Peroxide

[illegible] know the quantity of [illegible] Alkali

[illegible] a quantity

[illegible]eight 100 grains [illegible]

[illegible] with water & [illegible] it

[illegible] until you have [illegible]

[illegible] the alkali, then take [illegible]

[illegible] and keep dropping it in

[illegible]fully until you have brought

[illegible] to the neutral point

[illegible] 2 Ounces of Lime & [illegible] Pounds

Barilla Powd. in 2 Gallons of

[illegible]iling water, when you will

[illegible] a strong Solution of Potash

[illegible] you evaporate & [illegible]

[illegible] Pounds

Ammonia exists only in the Gaseous form

Ice is quickly Melted by Ammoniacal Gas on account of its affinity for Water. Ammoniacal Gas is procured by a Mixture of lime & Muriate of Ammonia (2 Parts, 1 Part)

A taper will not burn in Ammoniacal Gas but Sometimes there is a yellow flame. Ammoniacal Gas may be decomposed by passing Electric Sparks thro' it.

It will Combine with all the Acid Gases passing from the Aeriform to the Solid State & fill a Phial with Muriatic Acid Gas and afterwards you can put a Similar quantity of Ammoniacal Gas without increasing its volume. The Ammoniacal Gas has a Caustic Taste & pungent. & is destructive to Animals Made to Respire it. Spirit of Wine Absorbs this Gas as well as Water. The Liquor Ammonia should be Stopt Closely—

Of Ammonia.

Form *gaseous.*—Smell extremely *pungent.*—*Caustic.*—*Azotic.*—Lighter than *Atmospheric Air*—100 cubic inches weigh 18,67 grains—Experiment of Professor Berselius, shewing its metallic basis.

Is absorbed both by *Water* and *Alcohol*; by the former with great rapidity, producing an increase of temperature and bulk (*Liquor Ammoniæ* P. L.) On the contrary, *Ice* dissolved in this fluid, produces cold.

Is in a slight degree *inflammable.*

Obtained from the distillation of *bones* and other kinds of *animal Matter,* but purest from the decomposition of *Muriate of Ammonia,* by *Potash, Soda,* or *Lime.*

May be decomposed in various ways; as by exposure to *Heat,* by the *Electric Spark,* in the reduction of *Metallic Oxyds,* by the distillation of *Nitrate* of *Ammonia,* &c. yielding in some cases *Hydrogen,* in others *Azotic Gas*: which gasses by particular modes of combination have been found to reproduce it, and are therefore considered as its elements.

Agrees nearly with the other *Alkalies* in the order of its attraction, both in the humid and dry way.

OF ACIDS.

Appear in general to consist of *Combustible Substances* in union with the base of *Oxygen Gas,* the proportion of which in most cases determines the degree of *Acidity.*—Several of them the immediate result of *Combustion.*

Distinguished by being *sour* to the taste, changing vegetable *blue* colours to *red,* and by their extensive power of combining with other substances.

The properties of the individual *Acids* dependent on the nature of their respective *Bases:* the stronger the attraction of their Bases for *Oxygen,* the less intense in most instances their *Acidity.*

All unite readily with water. *Diluted Acids.*

In combination with *Alkalies* form for the most part what are called *Neutral Salts;* with *Earths* and *Metallic Oxyds, Earthy* and *Metallic Salts.*

Most of the acids *antiseptic.* Some powerfully *corrosive.*

Admit of different distinctions—from their form, into *solid, liquid,* and *gaseous;* from their

The peculiar Smell of Harts horn arises from a portion of Empyreumatic Oil. this Makes it diff from Liquor Ammoniae; Ammonia is Contained in various Vegetables in the Class Tetradynamia as Cabbage &c. Ammoniacal Gas may be obtained from Common Soot &c. To procure it from Animal Substances a large iron Vessel is used by the Manufactories of it when the bones by burning have become quite white they look as if they contained nothing but bony Substance. The first thing the Manufacturer does is to break down the bones and boiled, put into the iron vessels from which pipes are going to three Cystern and these again with Casks which receive the Ammoniacal Gas

Tin Filings which has a powerfull attraction for Oxygen Moisten it with a little Nitrate of Copper: the Zinc in the Tin Filings Combines with $\frac{2}{4}$ Nitric Acid.

By throwing in a little quick lime you decompose

The Test for Ammonia is to Moisten a bit of Glass with Muriatic Acid, it will produce white fumes.

A portion of Ammonia is evolved when urine rests in the Open air. Ammonia Combines with Oils & animal & Vegetable Mucilage forming an imperfect Soap. Eau de luce is made of Oli of Liquor Amm: R. Mast: ℥j Ol: Lavend. M xxxx [illegible]

Pure Ammonia acts only the Metals when they are in a State of Oxyde (that is without you admit Oxygen) Copper put into Liq. Ammonia and expose to the Air it attracts Oxygen. and changes its color;: but if it is excluded from the Air it is not acted upon

Sebeck of Jena in 1808 discovered that Mercury was acted upon in a curious manner by Subjecting it to Galvanic Influence in a piece of Carb: or Muriat of Ammonia, an amalgam is formed. the Mercury extending itself & Combining with the ~~Hydrogen~~ Ammonium

more usual and abundant sources, into *mineral, vegetable,* and *animal;* into such as have *simple,* and such as have *compounded* bases.

The more important of the *Acids* are, the *Sulphuric, Nitric, Muriatic, Carbonic, Fluoric, Boracic, Acetous, Tartareous, Oxalic, Gallic, Phosphoric* and *Prussic.*

Of Sulphuric Acid.

Formerly called *Acid, Oil,* and *Spirit of Vitriol.*

Long considered as the *Universal Acid.*

Seldom found uncombined.

Obtained artificially from the rapid combustion of *Sulphur,* or of a mixture of *Sulphur* with *Nitre,* or from the distillation of *Sulphate* of *Iron.*

Concentrated afterwards by *boiling.*

When pure, *limpid, ponderous, unctuous, inodorous,* and intensely *sour.*

Specific gravity nearly double that of *Water.*

Has a powerful attraction for *Moisture,* and on mixture with *Water,* occasions a remarkable increase of temperature.

When volatilized by the higher degrees of heat, it assumes the form of a dense white va-

pour, the first portions of which sometimes congeal if exposed to a moderate cold. *(Glacial Oil or Acid of Vitriol.)*

By treatment with *Combustible Substances* is generally more or less discoloured, and may be either deprived of a portion of its *Oxygen*, and thereby made to assume the form of *Gas*, or totally decomposed and reduced to its original basis, *Sulphur*.

The properties of *Sulphureous Acid Gas*, which may be also prepared by the *slow* combustion of *Sulphur*, in many respects different from those of the *common Acid*; its compounds therefore differently denominated. *Sulphite of Potash*, &c.

The *Sulphuric* superior to most *Acids* in its *Power* of *Attraction* for other bodies.

Independently of its *Water*, supposed to consist of 42,3 parts of *Sulphur* and 57,7 of *Oxygen*.

The order of its attraction *Barytes, Strontian, Potash, Soda, Lime, Magnesia, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Combined with *Alkalies* it forms :

1st, *Sulphate of Potash (Potassæ Sulphas* P. L.*)* usually prepared from the saline mass which remains after the distillation of *Nitric Acid*.—Form, hexangular prisms with hexahedral pyramids—prism frequently wanting.—Taste, *saltish*

bitter.—Difficultly soluble in water; also very difficult of fusion—May be decomposed either in the *moist* way by *Barytes,* or in the *dry* way by calcination with *Charcoal.*—100 parts consist of 42,2 of *Sulphuric Acid,* 50,1 of *Potash,* and 7,7 of *Water* —Application chiefly *medical.*

Super Sulphate of Potash—crystallizes in slender needles or hexangular prisms—soluble in five parts of water, contains twice as much acid as the sulphate. (*Potassæ super Sulphas* P. L.

2d. *Sulphate of Soda* (*Sodæ Sulphas* P. L.) obtained by solution and crystallization from the matter left behind in the preparation of *Muriatic Acid, Muriate of Ammonia,* or *Muriate of Quicksilver.* Is also found native in many mineral springs. Form of its crystals, *hexangular prisms with dihedral summits.*—Taste, *bitter.*—Effloresces on exposure to *Air.*—Readily soluble in *Water.*—When exposed to *Heat,* undergoes watery fusion. May be decomposed in the same way as *Sulphate* of *Potash.*—100 parts consist of 23,52 *Acid,* 18,48 *Soda,* 58 *Water.*—Used only in *Medicine.*

3d. *Sulphate of Ammonia*, obtained by the union of *Sulphuric Acid* with *Ammonia,* on the addition of diluted *Sulphuric Acid* to liquid *Carbonate of Ammonia.*—Form, *crystalline.*—Taste,

bitter, pungent.—Easily soluble in *Water. Fusible. Volatile.*— Employed principally in the manufacture of *Muriate* of *Ammonia.*

Sulphuric Acid forms also with the *Earths* and *Metallic Oxyds,* particular compounds, to be hereafter spoken of under their respective heads.

Employed principally in *Dying, Bleaching, Tanning, purification of Oils,* and *in Medicine.*

Of Nitric Acid.

The basis of this *Acid* is *Azote*—consists of *Nitrous Gas* or *Nitric Oxyd,* and *Oxygen.*

100 parts of *Nitrous Gas* consist of 43 *Azote,* 57 *Oxygen.*—100 cub. inches weigh 33,92 grains. Partly absorbed by *Water*—effects on animals—and on combustible substances—decomposed by the *Electric Spark*—also by *Sulphurets* and some of the *Metals*—means of procuring—test of its purity—reproduces *Nitric Acid* by the addition, and furnishes pure *Azote* by the subtraction of *Oxygen.*—100 parts of dry *Nitric Acid* said to consist of 68,06 *Nitrous Gas* and 31,94 *Oxygen*—or about 29,5 *Azote* and 70,5 *Oxygen.*—*Nitric Acid Gas* rapidly combines with *Water* and

Nitric Acid

In the Nitrous Oxyde ⅔ Oxygen is in a State of Condensation. It Consists of 1 Measure of Oxygen and half a Measure of Azote

Azote can exist in a diff. State that is it can take more Oxygen Gas.

Equal Measures of Oxygen & Azote form Nitrous Gas

2 Vol.   105

Nitrous Gas when in Contact with Oxygen absorbs it rapidly and forms Nitric Acid. Nitrous Gas is easily made by Pouring on Quicksilver Nitric Acid.

Phosphorus will burn Splendidly in ~~Nitric Acid~~ Nitrous Gas

there has been much diff. of opinion concerning the
quantities of Nitrogen gas & Oxygen to form Ni-
trous [illegible] Dr. Allen thinks [illegible]
If [illegible] form a large quantity Oxygen the acid is
[illegible] diff.

Nitrous acid gas diff.t to procure as [illegible]
known as substance to confine. The only way
to get it is to take a glass [illegible] & [illegible]
Oxygen [illegible] at a very strong
temperature [illegible]
It is heavier than Nit. gas 100 cubic inches weig.
75 grains. — It is procured from [illegible]
of acid [illegible] Potass. Nitre & [illegible]
The [illegible] employed in these [illegible]
[illegible] the [illegible]

Nitric Acid is readily procured by 60 Parts of Pot: Nitras 29 Parts of Concentrated Sulphuric Acid - Lute Woolfs Apparatus together - In the Process of Distillation the heat should be very moderate otherwise when the Salt becomes fluid it will be thrown out of the retort and perhaps break the receivers - you Get more Nitric Acid by a Slow Process - if you wish to get every portion of Acid you must use a larger portion of Sulphuric Acid - to the same portion of Potass: Nitras. In large Manufactories they use Iron Vessels for the Preparation of Nitric Acid - this process will procure it suff: pure for the Dyer &c but for Nice Chemical Experiments it is not fit for it Contains a portion of Acid: Muriat: which by pouring into it a Solution of Nitrate of Silver when there will be a Cloud - if there is Sulphuric Acid: the Nitrate Baryt will discover its by a Cloud being formed - The Residuum in all these Cases will be Potass: Sulphas

if Acid: Nitr: is exposed to the air & light it will be deprived of part of its Oxygen therefore reduced to Nitrous Gas. it becomes Colored - but it may be restored by Distillation but this will decompose it and lessen the quantity Nitric Acid will boil when diluted at 219 or 220 but when Concentrated it will not boil till the thermometer rises to 240.

forms *liquid Nitric Acid.*—100 parts spec. grav. 1,5 consist of 91,55 *Acid* and 8,45 *Water.*

Obtained from the decomposition of *Nitrate* of *Potash* by *Sulphuric Acid,* or by *Sulphate* of *Iron.*

Purified by re-distilling it from a fresh portion of *Nitre,* or by the addition of *Nitrate* of *Silver* and of *Baryt.*

In its common form, of a *yellowish* or *orange* colour: when pure, altogether *colourless.*

More *volatile* and less *ponderous* than *Sulphuric Acid*—its *Acidity* equally intense—attracts *Moisture* also from the atmosphere. (*Acidum Nitrosum dilutum* P. L.) *Aqua-fortis.*

Destructive, more immediately than the *Sulphuric Acid,* of the life and texture of bodies to which it is applied.

On mixture with *that Acid* communicates to it the property of dissolving silver: *Aqua Reginæ.*

Experiments of Cavendish and Milner on *Nitric Acid*—its spontaneous production by processes of nature.

Nitric Acid dissolves all the *Earthy Bodies* except *Silica.*

In its action on the *Metallic Bodies,* it is decomposed to a greater or less degree according

to their capability of uniting with a larger or smaller proportion of its *Oxygen.*

Similar effects produced on it by *Charcoal, Phosphorus, Sulphur,* and most other combustible substances; as also by exposure either to *Light* or *Heat.*

Hence the difference, if any, between *Nitrous* and *Nitric Acid,* and the formation of *Nitrous Gas,* and *Gaseous Oxyd* of *Azote.*

In some instances, the reciprocal action such as to occasion immediate inflammation, as on mixture with *Essential Oils.*

Combined with *Alkalies* it forms,

1st. *Nitrate of Potash (Potassæ Nitras* P. L.) Obtained in the East Indies and other countries, by the elixation of certain soils, in which it is either spontaneously and repeatedly produced by their exposure to Air and Light, or formed upon the addition of *Potash.*—Those soils more especially productive which abound in vegetable and animal matter that has run into a state of putrefaction.—Freed from extraneous saline matter by repeated crystallization.—Form of its crystals *prismatic.*—Taste, *cold, saline, penetrating.*—Much more soluble in hot than in cold water.—In a moderate heat it undergoes watery

Davy is of opinion when Nitric Acid is combined with a base the proportion of Oxygen is one and a half.

Nitric Acid is more immediately active on bodies than Sulphuric Acid & when mixt with the Sulphuric Acid gives the power of dissolving Silver. Nitric Acid stains the Cuticle when applied to it and destroys it — Cavendish mix^d 5 Part of Oxygen to 4 parts of Atmospheric Air. When he introduced a portion of Soap leys & taking thro it Sparks of electricity

Nitrous formed Nitric Acid from the black oxyde of Manganese & ammonia the

Nitric Acid may be decomposed by making a tube in the Middle red hot which has a strong attraction for Oxygen and this Tube communicating with a retort in which there is Nitric Acid. when heat is applied to the retort, Nitrous ~~Acid~~ Gas will be produced. —

Nitric Acid may be existing in old rubbish but it may be decomposed.

Charcoal powder when dropt into very Strong Nitric Acid ^very good^ will produce Sparks of fire. Nitric Acid ^Nitric^ Should be never kept in large quantities for it is a Dangerous material. it is so very Combustible: the separation of [illegible] the Nitrous & the [illegible] of iron that it is impossible [to] procure Nitrous or Nitric Acid free therefore [illegible] to [illegible] them [illegible]

Essential Oils will be immediately decomposed by Nitric Acid: as Ol: Terebinth: .. for these Oils consist of Carbon & Hyd.n forming the last is formed by Nitrous Acid or Nitric

Nitric Acid will dissolve all the earth except Silex

you may always know a Nitrate by heating it it will yield Oxygen —

Nitrate of Potash [illegible] regarded as a [illegible] of [illegible] Carbon [illegible] always [illegible] a Detonation —

The Goodness of Gunpowder is very dependent on the Charcoal to make which the Alder Willow &c are preferred.

In Purifying Nitrate of Potash you must take
care not to apply the heat too long but pour it
out on these Pans in order to get ... Clip...
...

Melted Nitrate of Potash is an excellent test
for Carbonaceous Matter. Take a little of it
and pour it on Charcoal when it will exhibit
a pleasing Phenomenon. arising from its
strong attraction for Oxygen. By a combi-
nation of these two Substances Gunpowder
is Made. The parts 75 Salt Petre. 15 Charcoal: Sulphur
10 Parts. Salt Petre is fused: Charcoal should be very good.
is best made in Iron Cylinders not in ye Common Method *
Nitrate of Potash may be decomposed by Sulphur
and Metals as well as by Charcoal.
Having provided pure Ingredients. The Salt Petre
Charcoal & Sulphur: is all ground to a fine
powder (but separately) they are all mixt
by a Vertical Stone working on an horizon-
tal one — If by accident it explodes at ye
beginning of the Process. it will not explode
very violently, but more so when the pro-
cess is nearly finished. — When thus
prepared. it is pressed into a cake by
a Press, it is then broke into small
pieces — and sifted. into pieces of the Size
of ye Common grains of Gunpowder: These grains
are dried afterwards: it is more
... dried by Steam. ...

When Gunpowder is good it will explode from off paper without making any Mark on the paper. —

12 Grains of Gunpowder in exploding will lift a very Considerable weight 8 [illegible] Pounds [illegible] being exploded on a paper [illegible] In detonation evolution of Carb. Hyd. Az. [illegible] very little water formed in the [illegible] of Gunpowder.

Nitric Acid: Combined with Soda forms Nitrate of Soda it resembles very much Nitrate of Potash it Chrystallizes in Cubes

Nitric Acid Combined with Ammonia forms Nitrate of Ammonia:

when Chrystallized it is a six sided Prism

Soluble in twice its weight of Cold water & half its weight in boiling water

Nitrate of Ammon: should never be kept in Metallic Vessels: 1 part of the Salt and 2 parts of Nitric Acid: will form a fluid Capable of dissolving Gold.

fusion (*Salprunellæ*).—An increase of the heat produces a decomposition of its *Acid*, the *Alkali* remaining unchanged.—May be more rapidly decomposed by the addition of *Charcoal*; hence the preparation of *Gun-powder*.—When decomposed in the moist way, by treatment with the *Sulphuric*, furnishes *Nitric Acid*. — 100 parts dried at 70 *Farenh.* consist of 44 of *Nitric Acid*, 51.8 of *Potash*, and 4.2 of *Water*.—Used extensively in *Glass-making*, *Metallurgy*, preparation of *Gun-powder*, and for *dietetic* and *medical* purposes.

2d. *Nitrate of Soda*, called formerly *cubical* or *quadrangular Nitre*. In most of its properties resembles the former.

3d. *Nitrate of Ammonia*; obtained by slow evaporation, from the combination of *Nitric Acid* and *Ammonia*.—Form, *crystalline*.—Taste, *cool, bitter, urinous*.—*Deliquescent*.—Easily *fusible*.—Under cautious distillation, yields *Gaseous Oxyd of Azote*, *Nitrous Gas*, and *Water*; but detonates when suddenly heated.

The *Order* of *Attraction* of this acid, the same as that of the *Sulphuric*.

Chief uses, in *Dying*, *Etching*, and *Assaying*; and sometimes employed in *Medicine*.

Of Muriatic Acid.

Obtained by decomposing *Muriate* of *Soda*, by means similar to those employed in the preparation of the *Nitric Acid.*

Its purest form *Gaseous.*

In this state heavier than *Atmospherical Air*; 100 cubic inches at mean pressure and temperature, weighing 39 grains; of a pungent *odour*; *irrespirable*; destructive to *Flame*, imparting to it under extinction a bright green colour; inflames the skin without discolouring or corroding it.

Formerly supposed to consist of an unknown radical intimately combined with *Oxygen.* Late researches of Professor Davy, by which this doctrine is controverted.

When dry has no action on the *Metals*, nor on any other of the *Combustible Substances.*

Exposed to a moist atmosphere it becomes *cloudy*—Is readily absorbed both by *Water* and *Ice*, the latter of which it liquefies: in either case it occasions an increase of *Temperature* and augmentation of *Bulk*, communicating to the water the general properties of an *Acid* (*Acidum Muriaticum* P. L.)

Muriatic Acid

[I]t is one of the Component parts of Muriate [of] Soda —

[M]any attempts have been made to decompose [i]t. It is obtained from Salt by Sulphuric [Aci]d, in order to procure eight or six Pounds of Common Salt put it into [a] Retort Connected with Woolfs [App]: then Put in Pounds of Water [and] Pounds of Concentrated Sulphuric [Aci]d: which is put into the Retort [w]ith the Muriate of Soda.

[In] this way you may procure it tolerably [p]ure: The Muriatic Acid in large Manu[f]actories is Made in large iron vessels [i]t will answer very well for their [p]urposes but it is not good enough [fo]r Chemical purposes: the Muria[t]ic Acid Contains Iron it is usually [of] a brown Color

[W]ater can take up: as much as 400 times [its] bulk of Muriatic Acid: Gas

The Muriatic Acid in its purest form is in y
State of Gas.
This gas extinguishes a taper & unfit for
respiration You procure this Gas by
taking 2 parts of Com: Salt heat it
you then put this Salt into a retort &
then pouring on it a little Sulphuric
Acid: and apply a Gentle heat when you
May by means of a bladder Collect this
Gas. —

This Gas when applied to Combustible Substances
does not have a very Considerable effect.

The liquid Muriatic Acid will readily dissolve
most of the Metals especially if it is exposed to
the Air, it readily Melts Zinc and Iron
but it has not any action on Gold Platina
the Liquid Muriatic Acid Combines readily
with y Alkalies and most of y Earths

A Solution of Nitrate of Silver is a good test
for this Acid, by Making a White precipitate

When Muriatic Acid is Mixed with Muriate of Potash
it forms the Salt of Silvius

...natic Acid do not act on Gold Platina Molibdenum

...muriates are decomposed by Nitric & Sulph: A...

...rthy Muriates are particularly deliquescent...
...sorb so much Moisture from the air.

...rgent: N A: is a very delicate test of the presence...
...d. Muriat: it discovers its by causing a...
... white Cloud — & it also enables us to...
... exactly how much Acid there is. Nitrate...
...ash is formed on the one hand & Muriate...
...ver on the other or Luna Cornea by the old...
...ists which contains 19 Parts of Acid
... oxyde of Silver

its weight
...mmon Salt soluble in 3 times of Water
...very little more if heated. Alcohol don't...
...ve Common Salt if Pure (Spirits) it...
...ed be the Sp Gravity 815 or 820 Water...
...f 1000 The Muriate of Soda is very...
...ure its Chrystalles are Cubical various...
...ramped don't deliquesce when Pure in...
...air, but its is usually containing various...
...s which cause it to deliquesce generally...
...ains Sulph: of Magnes & Lime this causes...
...aste of Sea Water then Salts form...
...nsiderable portion Diff't proportion...
...iff't parts At the Baltic its estimated at...

Common Salt generally has in it
Sulphate of Magnesia & Sulphate of lime

It constitutes the Saltness of the Sea Water
it may be procured by evaporation
Muriate of Soda found in immense quantities
in diffr parts of the World as Cordova In
Russia in some places so abundant & large
that they build huts with it. In this Country
as Cheshire it is found generally coloured brown by a mixture of Argil &c
for preparing it a certain place is chosen
by the Side of the Sea a Pond is made
and by the Side of this pond there is another
beyond this a third more inland
these ponds are exposed to the heat of
the Sun which of course is carried off
partly by evaporation: it is then let
into the 2nd Pond: & then into the third
which is nearest the boiling house
when it is let in and boiled and evapor
ated & Chrystallization soon commences. it is
then put into baskets thus called basket Salt
and another form of it is the Bay Salt

Muriatic Acid dissolves also some of the *Metals,* as *Zinc* and *Iron,* with the production of *Hydrogen Gas;* and shews a superiority of attraction for most of the *Metallic Oxyds.*

In its liquid and more common form it readily dissolves and unites with all the *Alkalies* and most of the *Earths.*—Its combinations with the former are,

1st. *Muriate of Potash,* formerly called *Salt of Silvius;* a salt but little used.

2d. *Muriate of Soda (Common Salt);* obtained by evaporation from *Sea Water,* or the water of *salt Springs,* or the solution of *Rock Salt,* which is found in several parts of the world in immense quantities.—Form of its crystals *cubical.*—Taste, agreeably *saline.*—Equally soluble in cold *Water* as in hot; soluble also in *Alcohol.*—Crystals burst or decrepitate on sudden exposure to *Heat.* Melt in a red heat without decomposition. May be converted into vapour by being intensely heated.—Promote the fusion of many of the *earthy* and *metallic* bodies.—May be decomposed in the moist way by *Sulphuric* and *Nitric Acids;* and in the dry way, by the *Phosphoric, Boracic,* and *Arsenic.* May also be decomposed by *Oxyd of Lead;* hence the preparation of *Turner's Patent Yellow.*—100 parts *Mur.* of *Soda* dried

at a red heat, consist of 46 *Mur. Acid,* and 54 *Soda.* New views of Professor Davy on the constitution of this *Salt*—Other methods of procuring *Soda* from it—Of extensive application in *Agriculture, Glass-making, Glazing, Metallurgy, Soap-making, Diet, Pharmaceutic Chemistry,* &c.

3d. *Muriate of Ammonia, (Ammoniæ Murias.* P. L.); found native in the neighbourhood of *Volcanos;* prepared also, in large quantities, in the dry way, by double chemical affinity from a mixture of *Sulphate of Ammonia* and *Muriate of Soda.*—Form, *concrete.*—Taste, *penetrating, acrid, urinous.*—Soluble both in *Water* and *Alcohol.*—Crystallizes under evaporation into small quadrangular *Prisms.*—Yields its basis readily to both the fixed alkalies, and to lime:—is also partially decomposed by sublimation with oxyd of iron. *(Ferrum Ammoniatum* P. L.)—Of extensive application in *Dying, Tinning, Soldering,* &c. Used also frequently in *Medicine.*

The chemical affinity of the common form of the *Muriatic Acid* in most instances weaker than that of either the *Sulphuric* or *Nitric;* but the order of its attraction the same.

On mixture, either in the liquid or gaseous state, with *Nitric Acid,* occasions in it a partial

Scotch Salt is not so Pure

The Sulphate of Lime in Sea Water embarrasses the Makers of Muriate of Soda extremely

The Method of Decomposing Common Salt is effected by diff: Methods.

Lime has ye property of decomposing Common Salt by Mixing it into a paste and putting it in bricks into a damp Cellar - Litharge which is an oxide of Lead will also decompose it 4 Parts & 1 Part of C Salt forming a Color Called Turner's yellow - we may likewise decompose it by Barytes: but we must recollect that this the Barytes is poisonous Muriate of Ammonia is found in Volcanos & the Mountains..

Also in Animal fluids usually met with in a Concrete form or taking the ~~self~~ shape of ye Bowl, The Taste Urinous, Acrid: Much used in Soldering and dying. in Soldering two pieces of Metal it is necessary that both surfaces should be very bright that is free from Oxyde

Those who Salt provisions prefer the Bay
Salt which is formed by long exposure to
the air & Sun & Chrystallizing slowly in
the Ponds. It is thought to contain no
superiority over the other. if its better
practical superiority depends on the largeness of
the Grains which dissolves less rapidly
thus pervade the meat more completely

What they call in Cheshire the Steam Salt
is made by evaporating the water more
hastily the resulting Salt is called by them
Steam Salt.
For the purposes of the large grain fish
Salt they only raise the temp to 11[illegible]
degrees & let it continue a long time
During the evaporation of the Salt there
will be a pellicle formed which if
viewed will be found cubical. & they
gather together & ultimately fall to the
bottom

Expt of Mr Allen

-Liverpool Salt is made by dissolving
-k Salt in Sea Water & found

it contained 99 Pts of Pure Muriate of Soda

-mington Salt contained in 100
-ts ~~contained~~ 96 parts of Muriate
-da

-m the Mother Liquor they make
-lphate of Magnesia

Soda is so very useful it has been
objects to obtain it from Common
-t

Duty on Common Salt is enormous. but
-ernments take off this Duty when
-de use of to make Soda.

-riate of Soda is useful in fluxing
-tals.-
-riate of Potash but little used.
-re Soluble in hot than Cold water

Muriate of Ammonia consists of Acid.
-r. & Ammonia: is rarely met with
-ther in Concrete form very
-luble in water & if carefully
-porated may be made to Chry-
-ze very regularly Soluble in
-irit

The Oxymuriatic Gas was first found by Sheild when you present a Subst: containing Oxygen to Mur: c & apply heat you obtain a peculiar Gas. Chlorine Sheild considered it a Simple Substance, 1774 Davy made the disc

Take 3 parts of liquid Muriatic Acid, conveying it & put into a retort, with black Oxyde of Manganese 10 Water capable of dissolving twice its volume of the Gas — then form what has been called liquid Oxy Muriatic Acid

Liquid Oxymuriatic Acid will become decompo-sed by light, but not by the air or heat. The liquid Oxymuriatic Acid is sometimes given in Medicine

it is very Much used in Bleaching. but speedily destroys the Green Color of Vegetables in fact all Colours except the yellows

Muriatic Acid will weaken vegetable fibres exceedingly if the Solution is too strong. The Manner make use of Lime with it then called Oxymuriate of Lime

The smell of Oxymuriated Muriatic Gas is pungent not respirable, 100 Cubic Inches of it weighs 76 ... g

it may be procured from oxymuriate of Potash and strong Muriatic Acid: a very gentle heat must be used in obtaining this Gas by this means

This Gas has an extreme effect on vegetable Colours

it acts powerfully on Putrid Infection, but from the Suffocating Nature of it, you must not suffer much to be evolved: Take Care to remove every portion of Iron from the room for it will spoil it

Muriate of Soda Manganese & diluted Sulphuric Acid in a Saucer will quit it

... — it can't be brought into a sick room ... Patient ...

decomposition, and acquires new properties: *Aqua Regia.*

An analogous change found to be produced on it by distillation from certain of the *Metallic Oxyds,* more especially from that of *Manganese:* hence the preparation of *Oxy-muriatic,* or as it was at first called, *Dephlogisticated Marine Acid.*

New views of Professor Davy on the nature of this *Gas*—Experiments tending to prove that it is a simple substance—and if so, the present name improper.

The sensible properties of this *Gas* distinguishable from those of all the other *Elastic Fluids*—Remarkable for its effects both on *Animal* and *Vegetable Colours*—Thought to possess the important property of destroying *putrid* and *contagious Effluvia*—Not so readily absorbed by *Water* as *common Muriatic Acid Gas*—Is materially affected by exposure to *Light,* is readily acted upon by most of the *Metallic Bodies,* and, in several instances, produces appearances like actual *Inflammation.*

Much heavier than *Atmospheric Air.*—100 cub. inches weighing 74,5 grs.

take fire in this Gas without having been previously heated Davy says Phosphorus combines with Chlorine in 2 diff proportions forming

2 diff Substances the Phosphorane & Phosphorana the last is a fluid

Ideas of Scheele on the constitution of this singular substance—Of Berthollet and the French Chemists—Of Dr. Henry—Important discoveries of Professor Davy; reasons which induced him to doubt the existence of *Oxygen* in it—Curious effects on *Phosphorus*—Highly negative with respect to *Electrical energy*—Means of procuring.—Singular compound of this *Gas* and *Oxygen*.

Its combinations with salifiable bases (hitherto called *Oxy-muriates)* afford *Oxygen Gas* when heated; triturated with combustible substances, they inflame and frequently detonate. The most important of these is, *Oxy-muriate of Potash,* obtained by cautiously evaporating and cooling a solution of *Potash,* saturated with *Oxy-muriatic Acid.* It crystallizes into flat hexhedral prisms or plates, of a pearly *lustre: Taste* faintly saline: moderately soluble in *Water:* on exposure to *heat* readily undergoes watery fusion, and, like *Nitrate* of *Potash,* yields great abundance of *Oxygen Gas,* but of more than ordinary purity.—Much more remarkable than *Nitrate* of *Potash,* for its power of detonating on mixture with several of the combustible bodies, as *Charcoal, Sulphur,* and *Phosphorus*; more especially the latter.

Nitrate of Potash & Sulph. Acid is good & for Nitrous Gas it acts in preventing Contagion

e Oxymuriatic Acid Gas acts powerfully on
e Surface of Mercury

If you take pure Muriatic Acid Gas, heat
Potassium in it, it will take fire after
being well heated, you put the Potassium
into a retort & exhaust it, by Means of the
Air Pump you then fill it with Muriatic
Acid Gas, when by applying a lamp to the
retort you will find the Potassium burn
brilliantly. The Action of Oxy Muriatic Acid Gas
or Chlorine on the Metals is very obvious
has highly negative properties. When Mixt
with Hydrogen Gas a remarkable Change takes
place. Take equal portions of Hydrogen &
Chlorine it will be found when these are
mixt common Muriatic ~~Gas~~ Acid, this Change
is directly brought about by exposing a Mixture
of these 2 Gases to the light of ÿ Sun it will
detonate. Phosphorous will Combine with
Chlorine or Hydrogen. when you introduce
Chlorine on Phosphorous it will take fire
is done in a retort.

It will act very Powerfully on Sulphur also

When Mixt with Carbonic Acid Gas forms a peculiar Compound, it forms a gas heavier than any other Gas.

In this Composition the Oxygen is Certainly Condensed

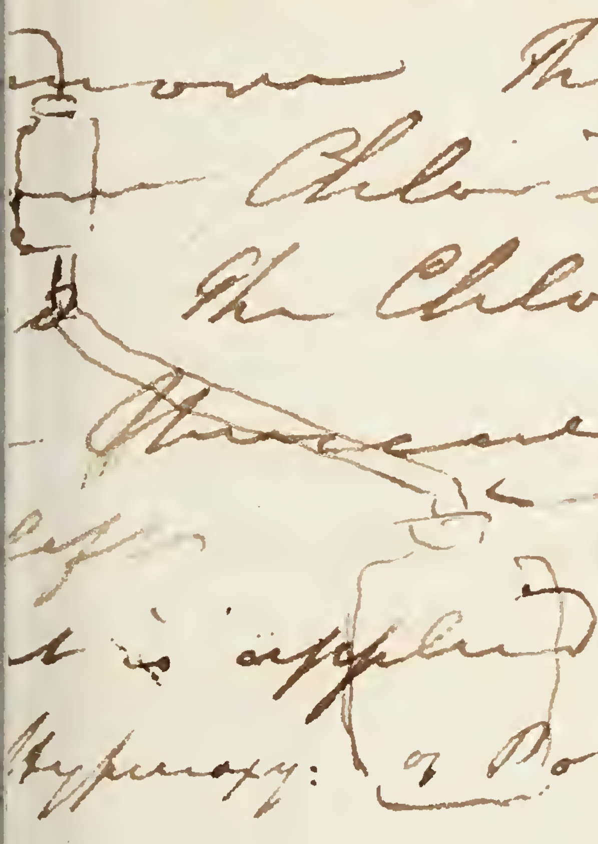
The Smell of this is different to Chlorine it does not act so powerfully on Metals as the Chlorine.

The Bleaching properties of Chlorine, is obvious it will Change a piece of Parsley almost white. (Chlorine is also Called Oxymuriatic Acid Gas)

-Flowers of Sulphur is exposed to Chlorine

hen Tin is Melted in it about 1/5 of the
l. of Gas were disappears & what is
t is hydrogen

- a small quantity of Hyperoxymuriate
Pot: & dilute Muriatic Gas & apply
gentle heat you get Hll Chlorine
is readily absorbed by water
in Chlorine 8 times its Bulk
known This Gas is easily separated
- Chlorine by mercury
The Chlorine fixes itself on
- Mercury & the Hll Chlorine
left This Gas Detonates when
t is applied



Hyperoxy: of Potash is made as very
-

requires 16 or 18 times its weight of Water
solve it

alt produces violent effects on being rubbed
Sulphur If this Salt is mixt up with Sugar Honey
- may set them on fire by Sulphuric Acid the
instances Fire bags are now made in this way

Experiments on the constitution of this *Acid.*—100 parts by weight consist of 28,60 *Carbon,* 71,40 *Oxygen.*

Charcoal, not an *Oxyd of Diamond* as erroneously supposed.—*Carbon* can exist in two distinct states of *Oxydation.*—*Gaseous Oxyd of Carbon.*

Procured by exposing the *Oxyds* of *Metals* and *Charcoal,* or a mixture of powdered *Marble* and filings of *Zinc* to a red heat.

Formerly considered as *Hydrogen Gas* holding *Carbon* in solution, and called by *Priestly Heavy Inflammable Air,* but proved by *Cruickshank* to be a distinct species, having *Carbon* for its basis combined with a limited proportion of *Oxygen,* inferior to that which constitutes *Carbonic Acid.*—100 cubical inches, middle temperature and pressure, weigh about 20 grs.—It is inflammable, and burns with a lambent blue flame, but does not explode with common air. And by combustion is converted into *Carbonic Acid.*

This acid, like others, is disposed to combine with salifiable bases. With *Alkalies* it forms,

1st. *Carbonate of Potash (Potassæ sub-carbonas* P. L.) usually obtained from the ashes of vegetables, by lixiviating them in water, decanting

da Water Contains a Solution of
bicarbonate of Soda

bonic Acid Gas is Made by passing
the Sulph. or Muriat. on Chalk &c
It may be employing leaden vessels
the Gas and with the vessel it is drawn up
a Syringe & by a Piston it is forced into
ing Tube & by this means the Water is
ingly impregnated

The Cooper (Water) 150 it never absorbs
Carbonic Acid Gas Spirit taken up
in those waters.

time in 2 proportion with Potash
ing the Subcarbon of Potash

We meet with Carbonate of Potash in
two States. 1st as a Subcarbonate or Salt
of Tartar. Pearl ash is like the Subcarbonate
of Potash. It may be easily prepared from
Bi-Carbonate of Potash.

Carbonic Acid Diminishes the Action of some other [illegible]

[illegible] with of Carb. Acid [illegible] of Atmosphere are [illegible]

Gas. Carbonic Oxide, made by passing a [illegible] [illegible] mixed under a Glass retort & applying a moderate heat . when the Car[illegible] Gaseous Oxyde of Carbon will come[illegible]

If 2 Vol of this Gas (Gaseous Oxyde of Carb) & [illegible] volume of Oxygen burning & the Electr[illegible] [illegible] there is your [illegible] diminish it to 2 parts, wh[illegible] [illegible] must be Carbonic Acid known by rendering Lime Wa[illegible] 100 Parts the Gas (Gas: Oxyde of Carb) consists [illegible] 49 Carbon & 51 Oxygen

At a Temperature high perhaps Carbon Acid [illegible] may be decomposed by any [illegible] having a [illegible] Attraction for Oxy[illegible]

Lime Water is a Good Test for Carb[illegible] Acid Gas

Spring Water contains Carbonic Acid

Carbonate of Soda is found at Teneriffe
and on the Sand in Egypt and elsewhere
it generally procured in the Country
boiling the Ashes of Barilla. It is
very soluble effloresces on exposure
a dry atmosphere more particularly

Potash is saturated with Carbonic Acid
may give a much larger dose of it

Berthollet. Take Subcarb of Potash 3 Pounds
and of Carbonate of Ammonia the
of Carbonic Acid will be given
the Carbon of Ammonia

Carbonate of Soda may be changed in the Com[illegible]
of quantity of Carbon Acid

Take Sal Amm. 1 Pound 2 Pound [illegible]
Common Chalk

Carbonate of Ammonia is procured
from Ammonia, soluble in 2 weights of
[illegible] 100 pts Consist of 56 Carb. Acid
18 Ammon. 26 Water & about 9 of Ammonia
[illegible] in the Course of the Preparation

In order to fill Smelling Bottles take 1 Part of
[illegible] Chalk 2 Parts put into a retort & apply heat [illegible]
[illegible] the [illegible] & form [illegible] of [illegible] & the Carb.
[illegible] & Ammonia will be combined

it is Soluble in Water in hence the
preparation of Aq. Ammonia it
is not Soluble in Spirit

Carbonic Acid is a powerful
Antiseptic. It is employed to foul
Ulcers as it is when Charcoal is applied

and evaporating to dryness.—Form, *powdery.*—Taste, *urinous.*—Colour, *pearly-white.*—*Deliquescent* in a moist atmosphere (*Liquor Potassæ sub-carbonatis* P. L.) May then be crystallized after cautious evaporation—May be decomposed in the moist way by most of the other *Acids,* or by *Lime* ; and in the dry way, by the simple application of *Heat.*—Uses various, as in *Glass-making, Bleaching, Metallurgy, Medicine, &c.*

2d. *Carbonate of Soda, (Sodæ sub-carbonas* P. L.*)* found native in *Egypt,* the island of *Teneriffe,* and elsewhere ; obtained also from the ashes of certain marine plants, by elixation, evaporation, and crystallization.—Form of its crystals, *octahedral.*—Effloresces on exposure to *Air.*—Its other properties and uses nearly similar to those of *Carbonate of Potash.*

3d. *Carbonate of Ammonia (Ammoniæ Carbonas* P. L.) ; obtained by distillation from most animal, and some vegetable and mineral substances : or from the decomposition of *Muriate of Ammonia* by *Carbonate of Potash,* or by *Lime.*—Form, *concrete.*—Smell, *pungent.*—Taste, *urinous.*—Very soluble in *Water* (*Liquor Ammoniæ Carbonatis* P. L.) Soluble also in *Spirit* (*Spiritus Ammoniæ* P. L.) With unctuous substances forms an imperfect *Soap (Linimentum Ammo-*

niœ P. L.). Like all the foregoing compounds, may be decomposed by *Potash, Soda, Barytes,* or *Lime.*

Carbonic Acid now universally considered as consisting of *Carbon* rendered acid by *Oxygen;* for which it has a stronger affinity than any other acidifiable base.

Inferior to most of the *Acids* in its *Attraction* for other bodies.

Order of attraction, *Barytes, Strontian, Lime, Potash, Soda, Magnesia, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.* Uses chiefly *medical.*

Of Fluoric Acid.

Obtained by decomposing *Fluate* of *Lime* by means of the *Sulphuric Acid.*

Form *gaseous.*

Heavier than atmospherical air, *Caustic.*—Kills animals immersed in it.

Unites readily with *Water,* and renders it intensely sour.

In union with the *Alkalies,* forms compounds of a gelatinous consistence.

Possesses the remarkable property of dissolving and volatilizing *Silica.*

...n with Lime called fluor Spar, it is also
...d in [illegible]

Fluoric Acid

...ed by Scheele in a particular substance [illegible]

The Radical for this Acid is not known

...e obtain'd by taking 1 Part of fluate of Lime
and 2 parts of Concentrated Sulphuric acid

...t when we want it in a very Concen-
...trated form we use a different Method
...n put no water in the Second Vessel

...c Acid Corrodes Animal Substances very
...ickly therefore we should be very careful
...o from the Gas arising from the Concentra-
...d fluoric Acid.

...mbined with Soda it forms fluate of
Soda which neither deliquesces or effloresces
...en exposed to the air.

...effects Glass very readily

This Acid does not act on Lead Silver &c but when in the State of Oxyde it will act on them very sensibly forms Fluates. It readily

This Acid effects Glaſs very sensibly

Coat ye Glaſs with Wax and then with a engraving Tool engrave what you Want? [illegible] [illegible] graduating [illegible] also [illegible]

It is used very much in etching of Glaſs

Water absorbs a large Quantity of the Silicated fluoric Acid Gas [illegible] 260 times its bulk

You can get the Silicated Fluoric Acid Gas by mixing in the Powdered Glaſs with the Acid. & fluate of Lime

On burning Potaſsium in Fluoric Acid Gas a great portion of Hydrogen is formed.

The Fluate of Lead is decomposed

… Fluoric Acid is capable of combining with Bo-
… and is crystallizable with Potash

… has a disposition to form a
… ble compound with Silex & fluoric Acid.

— 1 Ounce of vitreous Boracic Acid
… of fluor Spar [illegible] [illegible] [illegible] —
— 12 times their weight of Acid Sulph.
… duced a curious Gas, of which 101 cubic
… les weighed 73 grains. This is the Gas which is
… posed to consist of the Oxygenated [illegible] [illegible]
~~[illegible]~~
~~… the Oxydes~~

… ated Fluoric Acid has not been affected by passing
… over red hot [illegible]

Boracic Acid

Comes to us from the Indies

This was formerly called the Sedative Salt. it presents itself in a Solid form and it feels like Cetaceum

[illegible]

Davy found the Mixing of Potassium & Boracic Acid [illegible] in a Copper or Iron Tube [illegible] after this apply h[illegible] Burning vitrified that he got a Chocolate Colored Mass and which being ~~burned~~ heated in Oxygen Ga[s] he obtained again Boracic Acid. it will take [illegible]

You prepare Boracic Acid by taking [illegible] a Solution of Borax, in water & parts and Dropping into it a little Sulphuric Acid or Muriatic Acid, until you have saturated it completely. x then it will [illegible] deposit Crystals of Borac[ic]. The Boracic Acid requires a great portion of water to Dissolve it. [illegible]

[illegible] Solution in Alcohol [illegible] afterwards burns with a green flame [illegible] vegetable blue [illegible] changed by [illegible]

Dissolves *Zinc, Iron,* and *Copper;* the other metals not acted on, unless in the state of *Oxyds.*

Decomposed by Professor Davy by means of *Potassium.*

Order of attraction, *Lime, Barytes, Strontian, Magnesia, Potash, Soda, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Use—*Etching on Glass.*

Of Boracic Acid.

Called formerly *Sedative Salt.*

Form, *concrete, scaly.—Semi-transparent* and of a *pearly lustre,* and *saline acid taste.*

Sparingly soluble in *Water;* more so in *Alcohol,* to the flame of which it communicates a greenish tinge.

When united with *Water* easily sublimed.

Fusible without addition into a transparent *Glass.*

Decomposed by *voltaic Electricity,* but more completely by *Potassium*—Experiments of Davy on this subject—Conjectures that the basis is *metallic.*

By combination with *Soda,* produces *Borate of Soda* (*Sodæ Boras.* P. L.); obtained, in an impure form, from the spontaneous evaporation of the water of certain lakes in the kingdom of *Thibet*; said also to be found in those of *South America.*—Purified by subsequent solution, boiling, and crystallization.—Form of its crystals, *prismatic.*—100 parts consist of about 34 *Acid,* 19 *Soda,* 47 *Water.*—Taste, *styptic.*—Readily soluble in *hot Water.*—Changes vegetable *blue* colours to *green.*—When heated, parts with its water of crystallization, and melts into a transparent *Glass,* which effloresces on exposure, and may be again dissolved in water.—Serves as a flux for all the *Earths* and most of the *Metallic Oxyds.*—May be decomposed in the moist way, by the *Sulphuric,* and several other acids; in the dry way, by the *Phosphoric* only.—Employed chiefly in *Metallurgy,* and *Glass-making.*

This *Acid* is found in solution in the water of certain lakes in *Tuscany*; or obtained artificially by decomposing *Borate* of *Soda* by *Sulphuric, Nitric,* or *Muriatic Acid*; or by subliming it with *Sulphate* of *Iron.*

Order of attraction, *Lime, Barytes, Strontian, Magnesia, Potash, Soda, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

[illegible] Solution of Boracic Acid in Spirit
[illegible] Wine gives a green flame when
[illegible]ut on Paper —— This flame is
[illegible]asioned by the blue flame which the
[illegible]rit gives, and the other Colored flame
[illegible]hich the Borax gives.

[illegible]en Boracic acid is strongly heated
[illegible] becomes vitrified

[illegible]ere is a Cheap Salt Called the Boracite
[illegible]hich contains a large quantity of the
[illegible]racic Acid

[illegible] obtain Borax heat the Tincal [illegible]
[illegible] form a Solution Evaporate [illegible]
[illegible] [illegible] Crystals [illegible]
[illegible] Rhombic [illegible]

[illegible] Method of Purifying Borax. —

[illegible] [illegible] is Capable of decomposing most of the [illegible]
[illegible] [illegible] in [illegible] heat decomposes them [illegible]

[illegible] [illegible] used on account of its [illegible]
[illegible] [illegible] & in making Glass

[illegible] Borax being heated to drive off the
water of Crystallization forms Glass of Bo[rax]

[illegible] [illegible] found containing abundance [illegible]
[illegible] [illegible]
[illegible] [illegible] Norway contains 30 [illegible]
[illegible] [illegible]

Acetic Acid

Vegetable Acids have generally [illegible] Radical [illegible]
oxygen in Carbon & Hydrogen

Some of them Cyder them & fermented
[illegible] may be all converted into Acetic Acid
[vin]egar.

The process of changing them appears to be a Diff[erent]
arrangement of particles & an addition of Oxygen
can appear the Liquor to the air [illegible]
they mingle. When vinegar has been
some time become [illegible] Putrefies
In order to keep vinegar it be put at once [illegible]
[illegible] & Boil them in Water & Cork close
vinegar is known to contain great deal of Mucilage
& Acid or Oxalic Acid Tartaric Acid
this Mucilage which gives common vinegar
its Color For internal purposes vinegar sh[ould]
be taken in Glass vessels

Specific Gravity of distilled vinegar only
[illegible] that of Water

Very considerable at Edinburgh vinegar
[illegible] usually concentrated

This cannot be concentrated by [illegible]
[illegible] of the [illegible] Brown. If you [illegible]
[carbo]nate of Potash into weak Acetic Acid you [illegible]
[illegible] & [illegible] of Potash [illegible] be [illegible]

In the same Manner Acetic Acid Combines with
Oxyde of Potash or Silver Copper with the Com-
form verdigris. Distilled Verdigris is nothing else
than Common [illegible] Acid dissolved & Evaporate
[illegible] obtain a beautiful Coloured [illegible]

Vinegar may be prevented from undergoing a change to Putrefaction, by having the Vinegar in Bottles, and place these Bottles in boiling Water and then Cork it, and it will keep for a long time. -

For the Purification of Vinegar for internal purposes, we must not use Metallic Vessels We must use Glass for this purpose.

Common Vinegar is very much Diluted so that we can take it in our food by a Common Spoon

We can procure strong Acetic Acid by adding to the Vinegar Potash an effervescence takes place. when the Particles of Potash Combine with the particles of Strong Acetic Acid, the result of this process is the Acetate of Potash. by evaporation you obtain this salt if too great a heat is employed it will be brown and will not be Soluble in Alcohol or Water entirely

Of Acetic Acid.

Procured from a number of substances capable of undergoing the vinous fermentation—Is largely diluted with *Water* in common *Vinegar,* and may be obtained from it by cautious distillation—Procured also by distilling *Wood*—When pure, without colour, and in taste moderately acid—May be concentrated by freezing—But most perfectly by combining it with a *salifiable base* and subjecting the compound to distillation—As *Verdigris,* or *Acetate of Potash* and *Sulphuric Acid*—Other methods—Sometimes called *Radical Vinegar*—Very *acrid*—Inflames the skin—Slightly inflammable—Thought to consist of 50 *Oxygen,* 14 *Hydrogen,* 36 *Carbon*—*Aromatic Essence of Vinegar* combined with *Potash* produces *Acetate of Potash (Potassæ Acetas* P. L.*)*; prepared by saturating *Potash* with *distilled Vinegar,* evaporating to dryness, melting the remaining mass, dissolving it in water, filtering and evaporating a second time.—Form, *flakey.*—Colour, *white.*—Taste, *pungent.*—*Deliquescent.*—Easily soluble both in *Water* and *Alcohol.*—Its acid decomposed in distillation.—Yields *Acetic Acid* on the addition of the *Sulphuric.*—Used in medicine as a *Diuretic.*

With *Ammonia* it produces, *Acetate* of *Ammonia* (*Liquor Ammoniæ Acetatis* P. L.); prepared by saturating distilled *Acetic Acid* with *Ammonia.* — Form, *liquid.* — Taste, *urinous.*— Employed as a *diaphoretic*; sometimes also used externally as a *discutient.*

Order of attraction, *Barytes, Potash, Soda, Strontian, Lime, Ammonia, Magnesia, Metallic Oxyds, Water, Alcohol.*

Of Tartaric Acid.

Obtained from *Acidulous Tartrate of Potash* by means of *Lime,* or *Carbonate of Lime,* and the subsequent addition of *Sulphuric Acid.* May also be prepared by the *Sulphuric Acid* alone.

Crystallizes in small transparent scales or needles. Not altered by exposure to *Air.* Readily soluble in *Water,* and of an agreeably acid taste.

Easily decomposed by *Heat.*

Yields *Oxalic Acid* by treatment with the *Nitric,* and *Acetic* by digestion with *Water* and *Alcohol.*

Its more important saline compounds are,

…ou apply Sulphuric Acid to Acetate of
…tash of 4 parts of y Acid 1/3 Parts of Acetate of
…tash by Distilling this you obtain Acetic
…id. it frequently contains a portion
… Sulphurous Acid, which arises
…om a Decomposition of y Sulphuric
…id in y Retort, of this it may be depurated
…putting y Acid into a clean retort
…d with it a little Black Oxyde of
…nganese & a little Barytes. by this
…eans you will get Pure Acetic Acid
… Saturating Soda Subcarb. with Distil.
…negar and evaporating it down to a dry
…ess.

…its Pure State its Acid Volatile & in
…me degree inflammable Nitric Acid
…verts it into water and Carbonic Acid

…does not act on y simple Combustible
…bstances but when Combined with …

…aromatic Vinegar is by Acetic Acid
…ngll.r ¼ for a Pint of Alcohol 2 Dra…
… ~~Alcohol~~ Camphire Essence of … ℥.
… Lavender ℥i, Ol. Pimento ℥i

it is possible to Obtain in the State of Chrystals but by being very Volatile it is difficult,

[illegible] combined on Gold &c — but in Appearance some of the Metals as Copper Nickel. Unites with all the [illegible] excepting Silex Argilla Zircon.

[illegible] Acid may be Combined with Soda & by boiling [illegible] as long as [illegible] the Acetate of Soda

Tartaric Acid

a Veg. Acid, in a Concrete form it has the radical Carbon & Hydrogen like that of Veg. [illegible] combined it contains Azote

When United with an excess of Potash it forms the Cream of Tartar (or Acidulous which is Sparingly Soluble in Boiling Tartrate of Potash), The Impure State of it is purified by Solution to Make the white Cream of Tartar.

It is met with in the juice of grapes Apples &c (Acidulous Tartrate of Potash) We obtain the Tartaric Acid from Common Cream of Tartar which Changes litmus paper red Showing excess in Acid this is dissolved in hot water then [illegible] a quantity of Carbonate of lime forms with Tartaric Acid an insoluble Compound forming Tartrate of which is a white insoluble powder [illegible] to the bottom Lime, from which the Tartaric Acid is formed [illegible] a quantity of Acid Sulph. equal the weight of the Chalk used the Acid [illegible] Combines with the Lime & form Sulphate of Lime or Selenite & the Tartaric Acid [illegible] [illegible]

[illegible]
Chrystals of Tartaric Acid is very soluble
water. Tartaric Acid is Discovered
affording Chrystals when saturated
tash: but it is not so in Soda.
[illegible]
Acid dissolves Oxyde of Iron hence
by Calico Printers [illegible]
[illegible]
forms triple Salts with most
the Oxydes of Metals and also with
tash. The Rochelle Salt is an instan
bined with 2 Salifiable bases
once obtained by adding to a Solution
Cream of Tartar Soda it is made
union of these two preparations
is a Mild Cathartic & taste rather
tter; in most of its properties
the Tartrate of Potash. —

[illegible] Tartaric Acid is forming from [illegible]
[illegible] Acid Argol [illegible]
White Argol

Take a Boiling Solution of Cream of Tartar
pour into a Boiling Solution Subcarbonate
of Soda

1st. *Acidulous Tartrate of Potash,* prepared from *crude Tartar* (the spontaneous deposit from new wine) by solution and evaporation (*Potassæ super tartras* P. L.), or by crystallization under cooling.—Form *crystalline.*—Taste agreeably *acid.*—Of little solubility in *Water.*—Decomposed by the application of *Heat*; its chief products, an *Acid liquor,* and *Carbonate of Potash,* which has therefore been called *Salt of Tartar.*—Of various application in the arts, as in *Tinning, Dying, Hat-making*; employed also extensively in *Medicine.*

2d. *Tartrate of Potash (Potassæ Tartras* P. L.); prepared from the solution of the former, either by precipitating its excess of acid by means of *Chalk,* or by saturating it with additional *Potash*—Form, *crystalline.*—Taste, *saltish-bitter.*—Attracts moisture from the atmosphere; also very soluble in *water*; hence its former name *Soluble Tartar.*—Decomposed by heat, nearly in the same way as the *Acidulous Tartrate of Potash.*—Employed only in medicine, as a *mild Cathartic.*

3d. *Tartrate of Potash and Soda* (*Soda Tartarizata* P. L.); obtained, by evaporation and crystallization, from the union of *Soda* with *Acidulous Tartrate of Potash.*—Form of its crys-

tals, *prismatic*.—Taste, *bitterish saline*.—In most of its properties, and in its application, analagous to the *Tartrate of Potash*.

Order of attraction of Tartarous Acid, *Lime, Barytes, Strontian, Magnesia, Potash, Soda, Ammonia, Alumine, Metallic Oxyds, Water, Alcohol.*

Use confined to *Medicine*.

Of Oxalic Acid.

So called from being contained in the *Oxalis Acetosella*, or *Wood Sorrel*.

Obtained from *Sugar, Malt, Galls,* and various other substances, as well animal as vegetable, by treating them with *Nitric Acid*.

Form, *concrete*. Crystallizes in transparent quadrangular *Needles*. Taste, very *Acid*.

Readily soluble in *Water*: soluble also, and without decomposition, in the *Sulphuric* and other *Acids, Spirit of Wine, Æther, essential* and *expressed Oils*.

Easily decomposed under the application of the higher degrees of *Heat*.

Forms peculiar compounds with the *Alkalies*, with most of the *Earths*, and with several of the *Metallic Oxyds*.

Oxalic Acid

…is Acid is existing in Common Wood …rrel & the Germans many times [illegible] …y [illegible] Dr Wollaston thinks it con…ns in 2 … & 4 proportion of Oxygen

To Make it Take 6 parts of Nitric Acid diluted …ith an equal part of Water 1 Part of the …st Loaf Sugar, it should be heated very …adually and Made under a Chimney to …ow the escape of the Nitric ~~Acid~~ gas fumes. The Sugar …prives the Acid of its Oxygen & forms the Oxalic …d. You now have a Solution of Oxalic Acid … the Chrystalles will be formed by Evaporation …it May also be obtained from Gum Arabic …y the way the same process with Nitric …d. Soluble in twice its weight of Cold …ter, and its equal weight of boiling Water

…alic Acid does not act on Gold Platina &c but most …werfully on Iron which it readily …ydates, for this purpose by Calico Printers …or taking out Iron Moulds &c

…e Compounds of this Acid with a Salifiable …sis are termed Oxylates, . it is capable of …ting with Potash in 1 2 & 4 proportions

…t of Sorrel as it is called is the Superoxylate

It is Capable of forming with Soda and then Makes Oxylate of Potash

The Oxylate of Ammonia is a very usefu[l] Compound and You have nothing to do than to Saturate down by Oxalic Acid Ammon[ia] & evaporate the Solution
Ammonia like y^e other Alkalies is Capable of taking

The Oxylate of Ammonia is a Delicate test for Lime, because the Oxalic Acid forms with the Lime an insoluble Compound which is precipitated To know y^e quantity of Lime present filter it and put it into a Crucible & apply heat

Citric Acid

It is existing in Cherries Lemons
Limes

This Acid like Oxalic forms with Lime
an insoluble Compound

We obtain it from Lemon Juice
and Carbonate of Lime, you throw
on a filter wash it & gradually dry

Its Chrystales don't deliquesce in the Air

It acts more powerfully on oxyde of Iron
than Oxalic Acid

which takes place, and subsequent *Caystallization.*

Forms small granular or needle-like *Crystals,* of a sour but not astringent *Taste.*

More soluble in *Spirit* than in *Water.*

Burns in the open fire, leaving behind a hard insoluble *Charcoal.*

In close vessels, yields an *acid Liquor* and a *whitish saline Sublimate.*

A similar salt procurable from Galls, by *simple Distillation*; this also called *Gallic Acid.*

Remarkable for the property of producing a black colour with *Iron* and its saline compounds; hence the formation of *Ink.*

Hydro-carbon the basis of both these forms of *Gallic Acid,* but united with different portions of *Oxygen.*

Of Phosphoric Acid.

Sources of this acid various. Usually procured from common *Phosphorus,* by deflagration; or by slow combustion, under long exposure to *Air*; or by treatment with the *Nitric Acid.*

When Ink has been obliterated it may be renewed by various means. — To do it you pencil the part with Prussiate of Potash and then follow it with Sulphuric Acid.

Common Ink when written with will not shew itself until it is heated by fire. Sulphuric Acid will thus act

The Metallic Solution of various substances have this peculiarity, if you write with a solution of Sugar of Lead nothing will appear, but you pass over it Sulphuretted Hydrogen Water.

Phosphoric Acid

To make it Take of Nitric Acid placed in a florence Oil flask and put in Sticks of Phosphorus until the Nitrous fumes Cease to pass off —
It forms Compound with Salifiable basis Called Phosphites

a Solution of Phosphites is Capable of precipitating Gold in Solution

strong Phosphoric Acid is produced when Phosphorus enters into rapid Combustion

Phosphoric Acid may be Concentrated by Evaporating the Water — —

Phosphoric Acid has not that Corrosive Effect on Animal Matter as Sulphuric Acid

Glass of Phosphorous is Rather Deli-
scent when exposed to the
Atmosphere..

It Combines with the Salifiable
Basis and forms Phosphates.
(Phosphoric Acid Does)

Phosphate of Soda is a Mild Cathar[tic]
it is more pleasant than the Sulpha[te]
of Soda or Sulphate of Magnesia

Differs in its sensible properties according to the degree of *Oxygenation :* hence distinguished into *Phosphoreous* and *Phosphoric* Acid.—In the latter form, generally liquid; but by evaporation and cooling, crystallizable into quadrangular *Prisms.*

Taste, intensely *acid,* but not *corrosive.* *Specific gravity* 2. 687.

Has a strong attraction for *Moisture.*

Under the application of the higher degrees of *Heat,* fuses into a transparent *Glass,* capable of re-assuming its *acid properties* by long exposure to *Air* or maceration in *Water.*

With the *Alkalies, Earths,* and *Metals,* forms particular compounds, the chief of which is, *Phosphate of Soda (Soda Phosphorata* P. Edin.); obtained by uniting *Phosphoric Acid* and *Soda* to the point of saturation, evaporating, and cooling. Form *crystalline.*—Taste not unpleasantly *saline.*—*Efflorescent.*—Dissolves readily in *Water.*—Forms a triple salt with *Ammonia (Sal Microcosmicus).*—Lately introduced as a *cathartic.*

May, like most of the other acids, be partially or totally decomposed, by treatment with different *inflammable substances.*

In distillation with *Charcoal,* re-produces *Phosphorus* ; this therefore considered as its *Radical.*

Order of attraction, *Barytes, Strontian, Lime, Potash, Soda, Ammonia, Magnesia, Alumine, Metallic Oxyds, Water, Alcohol.*

Of Prussic Acid.

Obtained from *Prussiate* of *Iron* (*Prussian Blue*), by boiling it in a solution of *Potash,* adding *Sulphuric Acid* to the liquor when filtered, and submitting it to distillation ; or by distilling a mixture of *Prussiate* of *Potash* and diluted *Sulphuric Acid,* and re-distilling the product from *Carbonate* of *Lime.*

Form, *gaseous.*

Unites readily with *Water.*

Combines with *Alkalies, Earths,* and *Metallic Oxyds* ; but these compounds easily decomposed by *Carbonic Acid.*

Ferruginous Prussiates—Their uses.—With *Oxyd* of *Iron* re-produces *Prussian Blue.*

Consists of the same elements as *Carbonate* of *Ammonia,* but in different proportions.

Order of attraction, *Barytes, Strontian, Potash, Soda, Lime, Magnesia, Ammonia, Metallic Oxyds, Water, Alcohol.*

Prussic Acid

It may be Made Gaseous.–

The Prussic Acid ought not to be exposed to the Atmosphere & light or the Crusses undo[illegible] ... leave the water.

It is principally of Animal Origin or Substances which Contain Azote. It may be procured by mixing Dried Ox blood with Subcarbonate of Potash (Blood ℥ij Alkali ℥. Pot: Subcarbonas) then heated until they no longer puff up; it must then be exposed to a red heat until it ceases to flame. – This substance thrown into Water produces the Prussiate of Potash which is very liable to decomposition.

Prussian Blue consists of equal parts of Oxyd: of Iron & Prussic Acid.

It is rather inflammable. Detonates when Mixed with Oxymuriate of Potash, when struck yields on sublimation Hyd: Ammon: Gas & Carb: [illegible]

Blood alone will yield Prussic Acid by Destillation & Spirit of Hartshorn in Leaves of Peach Kernels of Apricots &c

To Scheele we are indebted for the Composition of this Acid.

Take 3 table spoonsful of Charcoal powd. the same quantity of subcarbonate of Potash subjecting these 2 substances to heat & then put in Muriate of Ammonia a Decomposition will take place

There is great tendency in Prussic Acid to Decompose and form Carbonate of Ammonia

When concentrated this acid is most violently poisonous

Prussic Acid is very Volatile - and Stands lowest as to the Salifiable basis of all the Acids

We obtain in the Liquid form because Water Absorbs the Gas so readily, but this should not be exposed to Atmospheric Air

It will boil at the temperature of 85 or 90 of Farenheit

Prussian Blue 3j and oxyd of Mercury boil them together & you get a Solution of Prussiate of Mercury

a Solution of Prussiate of Mercury & Iron filings put into a retort and a little concentrated Sulphuric Acid; it will cause a Decomposition & by it you obtain Prussic Acid - a clear Solution [illegible] & you will obtain the poisonous [illegible]

In order to act on Potash it must be Combined with Alkali;—

Cyanogen Gas by the French Chemists, when Combined to Hydrogen called Hydro Cyanogen Acid

The Green Sulphate of Iron is precipitated white by Prussic Acid but become blue when exposed to the Air,

Prussic Acid. Alkalies & earths seem to have the strongest Affinity for it.

The Triple Salts formed by this Acid & Alkalies & earths, and Carbonic Acid are very unlikely to Decomposition

Prussic Acid is Capable of 2 States of Oxydation first the Prussous Acid and 2nd by the Prussic Acid

The Solution of Prussic Acid will precipitate the Metals but not y Earths therefore Valuable as. a Solution of Copper it precipitates a brown Color: a Solution of Nitrate of Lead it will precipitate a white Color, a Solution of Nitrate of Silver it precipitates a yellow.

[illegible] Prussiate [illegible] a Solution of Potash [illegible] together [illegible] will be changed to [illegible] [illegible] Color, after then pour this [illegible] upon a filter the [illegible] [illegible] of Prussiate of Potash

To Make the Salt:

Take Caustic Potash add to it powdered Prussian Blue, which Changes its Color to a brown and Continue adding the P. Blue until the Color of it is no longer Changed then filter it and you obtain a Clear Solution of ferruginous Prussiate of Pot: which is much more permanent the Sulphur which it is very liable to Contain is got rid off by — By evaporating the Solution you obtain the Prussiate of Potash in Chrystalls. The Mass that is left on the filter will you find Contain a portion of Prussian Blue

Benzoic Acid

little Soluble in water then have in a solid form from Gum Benzoin merely by heating it, found in Balsam of Peru & Tolu.

It has been discovered Combined with Lime in the Urine of Horses & Cows

24 Parts of hot Water will Dissolve one part of it. Alcohol Dissolves it Completely

Powder G. Benzoin subject it to heat and Cover the Vessel by a Drum on which on the Sides the Acid adheres. To Purify it subject it to a Strong press and again Sublime it. when beautiful white Chrystalls will be obtained. From: Amber by heat the Succ Acid is obtained an expensive Acid. Succinate of Am is the only useful form of it.

OF EARTHS.

Though comparatively *few* in number, met with under an infinite diversity of appearance, and in such abundance as to constitute the basis of the more solid parts of the globe.

Seldom if ever found free from foreign admixture: when purified artificially, distinguished by their want of *Tenacity, Fixity,* sparing solubility in *Water, Insipidity,* want of *Odour,* incapacity of communicating a tinge to *Glass,* and their specific gravity not exceeding that of *Water* more than in the proportion of five to one.

These characters possessed more perfectly by some of the earths than by others: hence their distinction into *saline* and *insipid.*

All the earths soluble in one or other of the *Acids*: cannot however be precipitated from their solutions, like the *Metals,* by *Prussiate* of *Potash* or of *Lime.*

Infusible even by the most intense degrees of *heat,* unless in a state of mixture; viz. with *each other,* with *Alkalies* or *other Salts,* or with *Metallic Oxyds.*

The earths at present known are, *Barytes, Strontian, Lime, Magnesia, Alumina, Silica, Zirconia,* or *Jargon Earth, Glucina, and Yttria.*

Of these *Lime, Alumina, Silica,* and *Magnesia,* by far the most abundant and useful.

Of Barytes, or Ponderous Earth.

Found in combination, 1st. with Carbonic Acid, *Carbonate of Baryt;* 2d. with Sulphuric Acid *(Sulphate* of *Barytes, Baroselenite;)* or 3d. with Sulphuric Acid, Silex, Sulphate of Alumina, Sulphate of Lime, and Petroleum, (*Liver Stone.*)

Obtained in a caustic or separate state, by exposing a mixture of *Carbonate* of *Barytes* and *Charcoal,* or *Nitrate* of *Barytes,* to a strong heat.

Colour *greyish.*—Taste *caustic,* poisonous.

Discovered by Davy to be a *Metallic peroxide.* —*Barium.*—Means of obtaining, and properties.

Slakes like *Lime* on exposure to air, and imbibes water with avidity, forming with it a powerful cement.

Malic Acid Aikin's Chemical Diction

useful in forming with Lime a
luble Compound. so by Means of
is Acid you obtain Lime from Barytes
ic Acid exists in a Variety of fruits.—
n disengage the Malic Acid from its
ther Acids by Alcohol. Malic Acid is
ot Capable of Chrystallizations.

Suberric Acid

is may be obtained by applying heat
pieces of Cork ——

6 Parts of Acid Nit fort & water
1 D° of Cork applying heat filter & Evaporate
drying. Formic Acid Lactic Sebacic
ic Acid.

Barytes

[illegible] ... The Compass[illegible]

[illegible]

[illegible]

[illegible]

Barytes

[illegible]

[illegible]

weight of Ammonia [illegible]
and apply heat

[illegible] the Sulphate of Baryta
[illegible] solution of Carbonate of Ammonia [illegible]
[illegible] the Sulphate [illegible]
[illegible] from the Ammonia [illegible]
Decomposition taking place
[illegible] Sulphuric Acid [illegible] with the
[illegible] the Carbonic Acid with the
[illegible] forming Carbonate of Baryta

[illegible]
[illegible]

[illegible]
[illegible]
[illegible]
[illegible] Carbonate of Baryta [illegible]
[illegible]

the [illegible] of Baryta [illegible] with the Sulphuric [illegible]
Nitric Acid [illegible]
[illegible]
[illegible]

Nitrate of Baryta [illegible]
[illegible] weight of [illegible]
[illegible] Baryta [illegible]
of [illegible]

Acetate of Baryta forming [illegible] shaped [illegible]
soluble in 12 times its weight of cold water
[illegible] of Baryta [illegible]
employed in [illegible]

Soluble in about 20 times its weight of cold, and in less than twice its weight of boiling water (*Barytic Water,*) from which in cooling it crystallizes in transparent prisms.

Imparts a lemon colour to the flame of *Alcohol.*

Unites with the *Sulphuric Acid* into a compound requiring for its solution 40,000 times its weight of *Water.*

With the *Nitric* and *Muriatic Acids,* forms crystallizable salts.

Unites with *Sulphur* into a species of Hepar (*Sulphuret* of *Barytes.*)

Order of attraction in the moist way, *Sulphuric Acid, Oxalic, Succinic, Fluoric, Phosphoric, Saccho-lactic, Nitric, Muriatic, Citric, Tartaric, Arsenic, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic* ; *Sulphur, Phosphorous Water, Unctuous Oils ;* in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Succinic, Fluoric, Nitric, Muriatic, &c.* ; *Potash, Soda, Sulphur, Oxyd of Lead.*

The *Carbonate* of *Baryt* and other forms of this earth, remarkable for their violent effects, when exhibited internally.

Used principally as a test for ascertaining the presence of *Sulphuric Acid.*

Of Strontian.

Found either in combination, with carbonic acid, *Strontianite*; or with sulphuric acid, *Sulphate af Strontian.*

Best obtained in a separate or pure state from *Carbonate* or *Nitrate* of *Strontian,* by exposing them to a strong heat, as in the preparation of *Baryt,* to which it is analagous in many of its properties.

Discovered by Davy to be a *Metallic Peroxide* —*Strontium.*—*Strontian* nearly resembles *Barytes*—Soluble in 160 parts cold water, in less of hot water—The solution on being evaporated affords crystals of pure *Strontian.*

Remarkable for the brilliancy of the flame which it exhibits when treated on charcoal by the blow-pipe; also for the red colour which it imparts to the flame of *Alcohol.*

The order of its attraction nearly the same with that of *Baryt,* though inferior to it in degree.

Of Lime or Calcareous Earth.

Found abundantly in different parts of the world, combined with *Carbonic Acid* in the forms

[illegible]

[illegible] is about [illegible] from the [illegible] of [illegible]
[illegible]
[illegible]
[illegible]
[illegible] Mineral Chemistry
[illegible]
[illegible] Mountain [illegible]
[illegible]
[illegible] Mountain Borough
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

[illegible]
[illegible]
[illegible] of Hornblende may be obtained by

[illegible]
[illegible]

Lime sometimes found with Clay when its called Marl

Same

[illegible] Pane Plate [illegible] Cover [illegible]
[illegible]
[illegible]
[illegible]
[illegible]

[illegible]
[illegible]
[illegible]
[illegible] of Cont[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

[illegible]
[illegible]

[illegible]
[illegible] of [illegible]

[illegible]
[illegible]
[illegible]

The Construction of Mortar must be varied according to the purposes intended for. Sand & Lime is $\frac{i}{7}$ Base of all kinds of Mortar

Argil, Silex & Lime must burn very easily.

refining of Sugar Making of the Hair from

of *Chalk, Lime-stone* and *Marble*—also in the bones and horns of animals, and the shells of fishes and the eggs of birds—Prepared for various purposes from *Carbonate of Lime,* by the continued application of a strong heat.

Form *concrete* or *powdery.* Taste *hot, pungent, caustic.*—According to Davy, is a *metallic peroxide.*

Soluble in about 500 times its weight of water (*Liquor Calcis* P. L.) Changes vegetable blue colours to green.

On being suddenly moistened, emits both *Heat* and *Light,* losing at the same time its attraction of cohesion, *Slaked Lime.* The same takes place spontaneously on exposure to *Air.* On further exposure attracts Carbonic Acid from the Atmosphere.

Though infusible *per se,* promotes very powerfully the fusion of most of the other earthy Bodies: hence its use in working metallic ores, more especially those of *Iron.*

Melts with *Borax* and *Microcosmic Salt,* without effervescence. Melts also with *Oxyd of Lead.*

Use of *Lime* as a cement—composition of mortar—substances which give it the property of resisting the action of water—importance of

Lime as a manure—methods of analysing *Lime Stones.*

Sulphate of Lime, called also *Gypsum* or *Selenite,* soluble in about 500 parts of water, but in less if the water contain an excess of acid—when heated to redness falls into a soft white powder.

Plaster of Paris—its uses.

With *Nitric* and *Muriatic Acids* forms *deliquescent Salts.*

Phosphate of Lime obained from burnt bones, sometimes found native, as in *Apatite.*

Fluate of Lime found in Derbyshire, Cornwall, and various parts of the world—When heated *phosphorescent*—With *Sulphur* forms a calcareous Hepar; with *Phosphorus* a liver-coloured compound, which yields *Phosphureted Hydrogen Gas* on the affusion of water; with *unctuous substances,* peculiar *Soaps.*

Order of attraction in the moist way, *Oxalic Acid, Sulphuric, Tartaric, Succinic, Phosphoric, Saccho-lactic, Nitric, Muriatic, Fluoric, Arsenic, Lactic, Citric, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic, Sulphur, Phosphorous, Unctuous Oils,* and *Water;* in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Succinic, Nitric, Muriatic, Fluoric, Lactic, Ben-*

..e Quick Lime that is used for Making
..ortar.. The more labor used in Making
..er the better. as it more effectually fills
the interstices. When Mortar is kept
.. a long time excluded from the air, it be-
..mes more durable. The Setting of
..ortar depends on 2 or 3 Causes,, If it
..to be exposed to Water it should be well
..- before it is exposed to it: [illegible] hydraulic
..parts of lime slaked [illegible] — [illegible] 3 parts of
..[illegible] clean sand.. it should be well incorporated
..and Water Cement is also Made: with
..al parts of Aberthaw.. and Sand.

..e is often employed in Agriculture, for this it
..uld be free from other earths. besides remedying
..ile effect of a cold earth, it hastens putrefaction
..d by this Means is useful in Vegetation. it
..uld be used only on Land where there is a
..ge Quantity of Vegetable Matter, but not
..erwise, as it would. injure the Land very much
..e lime Stones which Contain Magnesia
..- the varieties of Marble Consist of Carbonic
..id & Lime —

Pliny informs us that the Ancient Romans
enjoyed that Mortar should be used [illegible]
3 years and having been excluded from
the atmosphere

The use of iron in forming Cements is seen the
foundries when the Shank of an anchor is broken
when the iron [illegible] is united in [illegible] be found
a binding Composition

Iron Ore mixed has the property of giving
binding to Cements under water.

The iron thrown off heated from by Blacksmith
when hammering it when [illegible] pounded [illegible]
& mixed with water forms a firm Cement

To Fish Ponds Take 2 Parts of Lime Containing
1 Part of Puzzolana & 3 or 4 Parts of sharp Clean sand [illegible]
forms one of the most Excellent water Cements

[S]ort of fluid Mortar is made by 2 Measures [illegible]
Earthen Lime [illegible]
the [illegible] and [illegible] with [illegible]
[illegible] [illegible] [illegible] [illegible]

Sulphate of Lime is useful in
[A]griculture. Sulphate of Iron will
[fert]ilify Calcareous Earths..

[T]o obtain Phosphate of Lime you will
[w]ash bone Ash, then add Muriatic Acid
[to] it, and then precipitate the pure Phos-
[p]hate of Lime by Ammonia.

[illegible] made [illegible] by
[illegible] of slaked Lime [illegible] of Sand [illegible]
and [illegible] Bone [illegible] & afterwards [illegible]
[illegible] added

[illegible]
[illegible]
[illegible] of Lime
[Sul]phate of Lime slightly soluble in Water [illegible]
[illegible] it may be [illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Magnesia

When Pure a White Powder, sparingly soluble
2050 times its weight of water
in Water but like Lime Can absorb a portion
and appear dry. Alkaline properties slight. It is
infusible in y^e greatest heat. It will Combine
with Sulphur only (of the Combustibles)
Can bring off from burning or producing carbo...
when the Carbonic Acid is driven off
In water Combine in an considerable portion

From a Solution of Sulphate of Magnesia
the Magnesia used in Medicine is prepared –
As precipitated by the Carbonate of ~~Soda~~ Potash

The Patent Magnesia is Made exactly by the same
process. The precipitation when Dry is Cut
into square pieces by Means of a Saw.
Magnesia, is Made by burning the Carb:
of Magnesia in a Crucible

Sulphuric Acid entirely dissolves Sulphuric
Acid, but it will not Sulphate of Lime
Oxylate of Ammonia will precipitate Nitrate
of Lime but not Magnesia therefore a test for
Lime. Pure Ammonia will throw down Mag:
nesia but not Lime

zoic, and *Acetic Acid*; *Potash*, *Sulphur*, *Oxyd of Lead.*

Used in *Dying*, *Bleaching*, *Tanning*, *Sugar-baking*, and various other arts, besides its application in *Medicine.*

Specimens of Stones in which *Lime* forms a principal part.

Of Magnesia.

Supposed by Davy to be a *Metallic Peroxide.*

Prepared from a solution of *Sulphate of Magnesia*, by the addition of *Carbonate of Potash*, and subsequent exposure of the washed earthy precipitate to a strong and continued heat (*Magnesia* P. L.)

Form *pulverulent.* Colour *pure white.* Taste *insipid.*

Requires for its solution 7,900 times its weight of water. Tinges vegetable blues of a light green.

Infusible without addition, even in the most intense degrees of heat, by which it is merely contracted in its dimensions; but melts into a glass with *Lime*, *Microcosmic salt*, or *Borax*, or with a mixture of *alumina* and *silica.*

Unites with all the Acids. With the *Sulphuric Acid* regenerates *Sulphate of Magnesia (Magnesiæ Sulphas* P.L.) With *Carbonic Acid,* Carbonate of Magnesia *(Magnesiæ Carbonas* P. L.)

May be combined, in small proportions, with *Sulphur.*

Order of attraction in the moist way, *Oxalic Acid, Phosphoric, Sulphuric, Fluoric, Arsenic, Saccho-lactic, Succinic, Nitric, Muriatic, Tartaric, Citric, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic, Sulphur, Phosphorus,* and *Water*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Fluoric, Succinic, Nitric, Muriatic, Lactic, Benzoic* and *Acetic Acid; Potash, Sulphur, Oxyd of Lead.*

In common use in disorders of the *Primæ Viæ* as an *antacid* and *laxative,* and in the form of steatite as an ingredient in the Manufacture of the finer kinds of *Pottery.*

Specimens of Stones to which it gives a distinguishing character.

Of Alumina.

Obtained in its purest form from a solution of common *Alum,* or *Sulphate of Alumina,* by the

Magnesia enters into y composition of
...rial Stones. In Steatite or Soap Rock
...enters The Lapis Ollaris it is in (or
...ot Stone)—

The Rock called Serpentine is a Magnesian Specimen

...e Steatite & Potstone are Magnesian Specimens

Argil

[illegible] is obtained from Common Alum
[illegible] by the Alkalis as ~~Sulphate~~ [illegible]
[illegible]

[illegible] Argil, its difference to Chrystallize [illegible]
[illegible] its evaporation

[illegible] Sulphate of Argil will Chrystallize
[illegible] Solution of [illegible] with Chrystall[illegible]
[illegible] Potash is added. The Chrystals are Octo[illegible]
[illegible]

[illegible] Alum [illegible] the Shapes [illegible] Common Alum
[illegible] Chrystallizat[illegible]

In a Solution of Common Alum ~~[illegible]~~ pour in Ammonia
& there will be a precipitate

Dissolve Argil in Caustic Potash & heat to redness. The
[illegible] Ammonia & you will [illegible]
the pure earth of argil left
The Pure earth of Argil is insoluble in Water

Some of the Earths have a Strong attraction for each other
[illegible] have a Strong attraction for Argil

[illegible] with argil [illegible]
[illegible] Ammonia & the Caustic Potash will take [illegible]
Argil

[illegible] Common Argil [illegible] heat [illegible]

...ngue has a Strong attraction for Vegetable Matter
...is invaluable to the Dyer as a Mordant

...ulphate of Iron is frequently a component part of ...
...umn which is prejudicial to the Dyer

...is may be got rid of by Boiling it & Throwing it into...
... this divides the particles very much & the Sulphate of Iron
...n be washed out. For Woollen this Ferr: Sulph: don't signify
...t does harm when for Silk &c
...a Solution of Cochineal be treated with a Solution...
...ngue The Colouring Matter of the Animal Solution
...ter Combines with it & forms the Colouring matter
...and lake Vegetable Matter answers equally well as Madder

...rench Chalk is a Magnesian Specimen. As a Steatite

...ay is very useful in making Bricks but it
...by burning rendered incapable of becoming plastic
... imbibing Water

...e brick may be made twice as strong as with
...om the same Materials The [illegible] the [illegible]
... is [illegible] Commenced the [illegible] [illegible]
...ate [illegible] [illegible] When the ashes of Coal are [illegible]
...ndon added there is [illegible] in making them
...[illegible] [illegible] They [illegible] burnt in a Kiln
...and Colour of Bricks & Tiles is dependant on [illegible]
...ide of Iron in a State of Peroxyde [illegible]

Insoluble in Water it May be Suspended in

When Dry it will absorb a Large Quantity

of Water. —

3 Argil 2 Lime 1 Magnesia when united will fuse in a [illegible]

Heat

Oxyg— has no effect on Argil. This is not correctly

ascertained

Argil has a Strong attraction for Vegetable &

animal Matter, which is very wisely o.

governed by Nature.

But above all it is useful in Dying, as a

Mordant

Fullers earth Consists of argil & Alum. therefore when app

to Vegetable or Animal Matter (which it is employed by some

for) on account of its Strong attraction for them it removes gre[ase]

Argil has a particular action on [illegible] Metallic

Oxyds. forming Ochres or what was formerly called

Boles. They are all in found in (cannot be done)

The Clay contracts a great deal when a high hea[t]

is applied thereupon in making Pottery it is necessary

to add a certain quantity of Siliceous Matter

it to prevent its Cracking

The Kentish black flints [illegible] its blackness among

some Carbonaceous Matter, is ground to a very fine

powder before it is used for making Pottery. This &

the common Tobacco Pipe Clay makes the [illegible]

Pottery. They used to sift the Silex but it injured the

workmen very much & the Silex being very insoluble [illegible]

injured their Lungs. The Silex is [illegible] with the [illegible]

[illegible] by machinery for the workmen at a great [illegible]

[illegible] make [illegible] about 10 1/2 [illegible] Bags.

Clay is not so readily acted upon by the strong Acids as Sulph: Muri: Nitric &c

Caustic Alkali readily dissolve it therefore exceedingly useful in Analysis as for example when with Lime & Magnesia which it will not dissolve.

addition of *Potash, Soda,* or *Ammonia*; hence its present denomination.

Form *powdery*. Colour, when dry, *pure white*. Feel *unctuous*. Taste *insipid*. Smell, when breathed on, *earthy*.

Insoluble in *Water*. When moistened becomes plastic, and contracts and hardens when exposed to the higher degrees of *Heat*; therefore the basis of the different kinds of *Pottery*. After baking is no longer capable of becoming plastic.

Soluble in the humid way by *Alkalies*.

Fusible, with effervescence, both with *Microcosmic Salt,* and *Borax*, fusible also with *Lime*.

Combines with most *Acids,* though with difficulty, except under precipitation, and produces with them compounds which are more or less astringent. The most important of these, the *Sulphate of Alumina* or *common Alum,* prepared from the decomposition of *Argillaceous Schistus*. This properly a triple, sometimes a quadruple, salt. Form of its crystals *octohedral*. Taste *astringent*. Soluble in about 14 times its weight of cold, and somewhat more than an equal weight of boiling water. Undergoes watery fusion, and parts with its water of crystallization, on exposure to *Heat* (*Alumen exsiccatum* P. L.) When calcined with certain in-

They now Strain it Mixed with Water thus a Scina

common Earthenware glazed ... Pints, White lead & oxyd of Tin & sometimes an Alkali they are melted &
Porcelain will bear the heat of a Common furnace without melting at all Porcelain when broken is looking like glass or something the appearance of wax. Common earthen ware looks granular

flammable substances, as yolk of egg, or sugar, produces a compound, which takes fire spontaneously on exposure to *Air* (*Pyrophorus* of *Homberg.*)

Has, of all the *Earths*, the greatest attraction for *Metallic Oxyds*; has also a strong attraction both for *Silica* and *Magnesia*.

Silver Lead antimony Shades of Manganese violet Enamelled ware

Order of attraction of *Alumina* in the moist way, *Sulphuric Acid, Nitric, Muriatic, Oxalic, Arsenic, Fluoric, Tartaric, Succinic, Saccho-lactic, Citric, Phosphoric, Lactic, Benzoic, Acetic, Boracic, Sulphureous, Carbonic,* and *Prussic*; in the dry way, *Phosphoric, Boracic, Arsenic, Sulphuric, Nitric, Muriatic, Fluoric, Succinic, Lactic, Benzoic,* and *Acetic Acid*; *Potash, Sulphur, Oxyd of Lead.*

Uses, comprehending those of Sulphate of Alumina, *Dying, Tanning, Printing, Silvering, Painting, Pottery, Medicine, &c.*

Specimens of Stones containing this Earth in considerable proportion.

The Glaze of Common plate is made of Oxyd of Lead & Tin & the oxyd of Lead & Tin 10 to 20 Pints they then with ... 4 ... of Soda ... & pound them with water when they prepared the plate is dipped into

... Vinegar is employed ...

Of Silica.

Exists, with very little mixture, in Sand, Gravel, Flint, and Rock Crystal.

Porcelain will bear the most fusible kind of Glaze as Borax. The earth of Porcelain for the earths They form the Chinese Porcelain or Japan ware.
Porcelain so Hard that it Strikes fire with Steel & will bear the Strongest heat without injury

...n the Cast has been taken they are Set by [illegible] after a-
...n burned in a Furnace [illegible] or glazing [illegible]
...th are drawn [illegible] artificially [illegible] them. They are
afterwards finished by other workmen as [illegible]
Polish & Ornament — They are heated again
...[illegible] into in a form which they Call Biscuit or
[illegible] Before them is an Glaze on the
Oxydes of Metals have the property of making
...[illegible] Coloured Glass —
...ide of Copper Green Cobalt Blue, Gold
[illegible] or Yellow —
...y ground up the Oxydes of Metals and painted them on
...[illegible] plates Ornaments they are afterwards heated
...n by the Glaze. The Common ones Pans are
...[illegible] with the Oxyde of Lead

Silica or Silex —

Flint Contains a large portion of it & many other Stones

It Cant be Chrystallized by art but under peculiar circumstances,

Is Capable of absorbing 1/4 of its Weight of Water
is infusible by itself in the Strongest Heat
Fluoric Acid acts on it very Strongly

Silex has a very strong attraction for ye Alkalies.

If 1 part of powdered Silex 3 Parts of Carb: of Soda, heat them together and it will afterwards dissolve in Water. Then by pouring in Acid: Muriat: you precipitate the earth, Silex, from the Ac having a stronger attraction for the Alkali tha the Alkali has for ye Silex.

Silex is not acted on by Oxygen and any combustible Substances.

Pure Caustic Barytes seems to act on it in ye Same Manner as ye Alkalies.

Silex is Obtained in a State of Purity from ye

When Silex is Melted with a large proportion of Alk it forms a Compound Soluble in Water but when united with a smaller proportion of alkal it forms Glass. This Substance was known at a very early period — in British Museum the are beads of [illegible] which they used to give as ornaments [illegible] [illegible] [illegible]

t was not tile the 3rd Century that Glass
came in general use for Windows
and then as ornament [illegible]

part Silex & 2 Parts of Calcined Borax
will form a fine Glass, this is the
composition made to imitate various
ones. they are Coloured by various Metals

Silex used in Britain for Making Glass
Sea Sand this is prepared by Washing &c
comes from [illegible] Norfolk
and for Common purposes they obtain
their Alkali from Wood Ashes & Kelp —

Green tinged glass is owing to the pre-
sence of Iron: a portion of Lime
used to prevent the Glass from cracking
when exposed to variety in temperature
it also causes to Work easier

Parts of Silex with requisite portion of Alkali
are not been more than 7 or 8 Parts

Borax is used in making the best Glass

Charges is very useful in making Glass
for Optical Purposes

[illegible] the Glass made with it is an [illegible]
[illegible] [illegible] it

Borax

Flint Glass is acted on powerfully by Sulphuretted Hydrogen

a Check.

White Oxyde of Arsenic is a powerful flux. but can only be used in small quantities for if in excess it becomes soft & [illegible] it is unsafe for Drinking Vessels
Nitre is used for Breaking some of the Coloured Glasses

When Perfect Transparency is wanted stir up the whole with a Wooden Pole

Silica mixed with twice its weight of Soda forms a Glass but it is Soluble in water & Deliquescent. Silex with the same quantity of Alkali is Neutral also; a Perfect Glass can be formed when the Alkali is 1/3 the Quantity of the Silex

May be separated from most of these by fusion with either of the fixed alkalies, and re-digestion in the nitric or any other of the stronger acids.

Colour *white*. *Insipid*. *Dry* to the touch. Sparingly if at all soluble in *Water*. Specific gravity 2.66. *Infusible*.

Soluble in the *Fluoric*, but in no other acid.

Soluble also in the solution of either of the *fixed Alkalies*, by the assistance of heat. Precipitates and combines with lime on being added to lime water; unites too in the humid way with some of the metallic oxyds.

May be fused with *Lime, Microcosmic Salt*, or *Borax*; but much more readily with *Potash* or *Soda*: hence the preparation of the different kinds of *Glass*.

When melted with a large proportion of *Alkali*, forms a deliquescent compound, *(Liquor Silicum,)* the decomposition of which by an *Acid*, furnishes a gelatinous precipitate, thought to be soluble in about 1000 parts of *Water*.

Order of attraction in the moist way, *Fluoric Acid, Potash*; in the dry way, *Potash, Boracic Acid, Phosphoric Acid, Oxyd of Lead*.

Used principally in *Polishing, Painting*, and *Glass-making*.

Specimens of Stones of which this Earth forms a principal part.

Of Zirconia, or *Jargon Earth.*

Combined with silex, iron, and nickel in the stone called *Jargon* or *Zircon:* found also in the *Hyacinth.*

Obtained from these by fusion with potash, and subsequent solution in, and precipitation from the *Muriatic Acid.*

Colour, *white.* Insoluble in water; when moist, *semi-transparent.* Specific gravity estimated at 4.300

When heated in contact with charcoal, is imperfectly vitrified, and becomes of sufficient hardness to strike fire with steel.

Resembles *Silica* in its action on *Metallic Oxides*, and *Alumina* in forming astringent compounds with the *Acids:* but differs from both in being insoluble in the *Fixed Alkalies.*

Order of its attraction as yet unknown.

Of Glucina.

Obtained by fusing *Aquamarine*, the *Beryl*, or the *Emerald* with three times their weight

s the Alkali is Volatile it is drawn off by the
... heat & the Salts which keep behind therefore
by error you have too much alkali there is only
expense of Fuel to drive off the Alkali

Crown Glass for Sheet ... Glass
... Sand 30 Parts 15 Part Pearlash or Soda
... 2 of Chalk — This is brought
a red heat & is then formed in panels
... Plate Glass used for Drawing &
Softer than Crown by

0 P of Wh Sand 33 Pearl ash
Oxyde of Lead 11 Part of Nitre & about
200 parts weight of the whole of the Materials
in little Glass. Plenums are made by draw-
ing it on a reel —

Plate Glass made as thus
0 Part Sand 67 of Sub Soda & 1 P of
... Manganese is ...
Portion of Borax may be useful these
materials are given 30 hours when the heat
... it poured into Moulds

Common Glass is Making Common
materials

Materials are Melted in a Large
... vessels

before the Materials are put into a Vessel
... are heated to ...

Fritting after this Process they are all [illegible]
together for 30 hours or more —
The materials are stirred — When the
fusing is over the next is the refining
Process —
After the glass is perfectly formed it [illegible]
by

Some principal instruments are a Supply
Table

If glass is suddenly cooled after it has
made it is very readily cracked therefore
after it is made into the form they are
it is sent to the annealing furnace
which cools it gradually —

Ziron (?) [illegible]

[illegible] from Sargon

order to [illegible] Para [illegible] Sarg[illegible]

[illegible] they [illegible]

[illegible] of [illegible] Alkali [illegible]

[illegible]

[illegible] is [illegible] by [illegible]

Alkali [illegible] the [illegible]

[illegible] it ought to be [illegible]

[illegible] and [illegible]

[illegible] from which [illegible]

Glucina

Called Glucin because the earths formed from it have an sweetish taste

Yttria

Resembles Glucina in forming earths of sweet taste & being soluble in Carbonate of Potash

Is a very rare Earth

Remarks on Agriculture

The manures which [illegible] [illegible] [illegible] is [illegible] by animal food

Carbon & Hyd. form a great part of the [illegible] of Vegetables. If the vegetables are removed as Hay & Corn is the soil becomes impoverished.

Water necessary to Earths for vegetables to germinate.

of *Potash,* separating the *Silica* and *Alumina* by the usual methods—then adding to the solution *liquid Carbonate of Ammonia* in excess, boil until the *Glucina* precipitates.

Colour, *white. Insipid. Insoluble* in water. *Adhesive* to the tongue. *Infusible per se*; but melts with *Borax* into a transparent *Glass.*

Soluble in most of the *Acids,* and likewise in the solutions of the fixed *Alkalies* and of *Carbonate of Ammonia.*

Its *saline* compounds slightly astringent, and of a *sweet taste :* hence its name.

Its affinity for *Acids* intermediate between that of *Magnesia* and *Alumina.*

Yttria.

Found in the *Gadolinite,* a Swedish stone, so called from this earth being discovered in it by *M. Gadolin.*

Procured by treating the powdered mineral with *Nitric* and *Muriatic Acids*—evaporating the solution to dryness—diluting with *Water* and precipitating the *Yttria* with *Ammonia.*

Colour of this earth *pure white*—Without *taste* or *smell*—*Infusible*—Spec. grav. 4,84—With *Borax* melts into a white transparent glass—Soluble in *Carbonate* of *Ammonia*, though not in either of the *caustic fixed Alkalies*—Insoluble in *Water*.

With the *Sulphuric, Nitric, Muriatic*, and with other acids, forms compounds remarkable, like those of *Glucina*, for their astringency and sweetness, to which earth it is considered in many respects as analogous, though in others essentially different.

OF COMBUSTIBLE SUBSTANCES.

The substances usually denominated *Combustible*, are such as are more especially remarkable for exhibiting the phenomenon of *Combustion*, when heated to a certain degree in contact with *Air*.

The changes produced on the *Air* in this process, and the alteration which the *Inflammable Substances* themselves undergo, already particularly treated of.

In their *Form, Consistence, Weight, Volatility*, &c. the substances of this class differ widely

[illegible] more divided the Particles of a Soil are [illegible] better – Thus Plowing & Harrowing are [illegible]ful.

[illegible] may be [illegible]

[illegible] Fertility of Soils influenced by Temperature [illegible] which causes the [illegible] is [illegible]

[illegible] Constituents of Ashes

Phosphate of Lime has been found in [illegible] [illegible] [illegible]

[illegible] Bones have been [illegible] for [illegible] better than Bones [illegible] [illegible] [illegible] [illegible] Gelatine [illegible] [illegible] [illegible] containing Gelatine [illegible]

vegetable Tribe containing much

Quick Lime very quickly promotes the d-
ecomposition of Vegetable fibre or
Animal Bodies & wherever a Soil
contains the roots of Plants or Peat
Quick Lime is very useful

Carbonate of Magnesia is Powerful [illegible]
[illegible] to Quicklime but this is
rendered by it absorbing quickly
large quantity of Carbonic Acid

Thatcomb [illegible]

Arrangements & Divisions of Rock
1 Primitive Rock, Granite, which is composed
of Quartz or Silex Feldspar & Mica
There is such a thing as Secondary Gr-
anite Porphyry is a Primitive Rock
[illegible] Gneiss is a
primitive Rock Trap

or Volcanic Formation

on the [illegible] for

[illegible]

[illegible] has been found to Contain the following ingredients [illegible]

50 Parts of Fine Sand 5 P Carbon of Lime

[illegible] of food of Plants 15 P of Silex 14 of Argil

[illegible] oxyde of Iron

Barren Soil

[illegible] from Sulphate of Iron [illegible]

[illegible] Lime [illegible] from Chalk [illegible]

Clay

Carbon is widely dispersed thro' the Globe

Animal & Vegetable Bodies

[illegible] Charcoal [illegible] the whole [illegible]

[illegible] it will be fit for [illegible]

[illegible] be found sufficiently

[illegible]

Carbon.

It is not found in a Solid State but very largely in a Gaseous form, it exists largely in Coal Wood &c—, its diffused in ye Air in form of Carbonic Acid Gas.

Charcoal differs in Purity according to ye Man[ner] it is produced

The Charcoal from Animal Subst: requires a higher temperature to burn it than that of Vegetable

Common Charcoal is generally produced from Oak - Chesnut &c Cut up & dried for 2 or 3 Months a Place on the ground is prepared & the wood Piled up with alternate layers of [illegible] [illegible] holes [illegible] the [illegible] & the fire is applied to it, &c

In Scotland they carry on ye process of Making Charcoal very extensively;

The Purest Carbon is perhaps procured from Lamp Black, for very delicate experiments.

Charcoal has a disposition to Absorb Water from ye Atmosphere and increase in Weight

Charcoal from [illegible] Lignum Vitae Box Oak Mahogany are [illegible] different Degrees of Density

from each other. They are comparatively *lighter* than most other bodies.

May be divided into two classes—*Simple* and *Campounded.*

The simple combustibles are, *Hydrogen, Carbon, Sulphur* and *Phosphorus.*

Hydrogen.

Already treated of under *Aeriform fluids.*

Carbon.

Obtained in its common form *Charcoal,* from vegetable, animal and bituminous substances by exposure to heat in close vessels.

Varies in its form, quantity and purity, according to the nature of the substance from which it is prepared.

The charcoal of common wood, *black, light, brittle, sonorous, insipid, inodorous,* and of great *durability.*

Capable of sustaining the most intense degrees of *Heat* in close vessels, without alteration; but

upon access of *Air*, burns with a white flame, and yields *Carbonic Acid Gas*, leaving behind a small quantity of *earthy saline Ashes*.

Decomposes the *Sulphuric Acid* and all its compounds, by the assistance of *Heat*.

Decomposes also the *Nitric Acid* without *Heat*, and sometimes with such rapidity as to occasion *Combustion*. Detonates with *Nitre*.

Dissolves, by fusion, in the *fixed Alkalies*; very readily also in *Alkaline Sulphurets*.

Combines by cementation with *Iron* either in a small proportion, *Steel*, or in a larger, *Plumbago*.

Of the properties and uses of *native Plumbago*.

Charcoal remarkable for correcting *Fœtor* and depriving many substances of *Colour*, especially when used in its fresh burnt state.

Exists in its present form in the *Diamond*.

Used chiefly as an article of *Fuel* and in certain arts, trades, and manufactures.

Of Sulphur.

Found either uncombined, as deposited by water, or sublimed by subterranean fire, *Native Sulphur*; or in combination with other bodies, more especially with different *Metals*.

For very Delicate Experiments we inclose pieces of Box Wood in a Crucible filled with Sand and apply a steady heat for about an hour - when you will procure pure Carbon, it should be kept in Dry stopped Closely, glass Bottles.

The Charcoal of Common wood is black, light, and sonorous..

Vegetable Substances are formed "Charcoal with [illegible] and of heat than when wood is [illegible] Charcoal is formed

when exposed to Solution of Silver or Gold it will [illegible] [illegible] becomes coated

Carbon is infusible in any Common Heat

[illegible] to make it with a Paste [illegible]

Charcoal & Linseed Meal when Mix'd form a very good lining for Crucibles [illegible]

Charcoal is a very Durable it's not Capable of Putrefaction: hence the practice of applying it to Stakes before they are driven into ground.. The Acids don't act upon it but it readily decomposes them.. Charcoal is Capable of Combining with iron. it's so Combined in Black Lead which being inclosed in Cedar forms the Black Lead Pencil.. Plumbago [illegible] Combin[illegible]

Charcoal detonates with $\frac{d}{7}$

The Best Kind is produced in this Country

The Substance of Carbon is Spongy & porous

it will absorb Carbonic Acid from Water completely

1 Part of Charcoal in a few hours will absorb three times its Weight of Atmospheric Air

Charcoal very readily will take the Coloring Matter of Various Substances

Charcoal has a great power in Correcting fator of bad Water or Meat, by either throwing it into y Water in which the Meat is lying or the Water that has been tainted.

It is rarely if ever found Pure. The Diamond is found to be the Most Pure: it will withstand the greatest heat.

We are at a loss to know How this the Diamond is formed. They are generally found

Diamond of all known bodies has the
[gre]atest power of refracting the Rays of
[Lig]ht they are excessively hard.

Pliny the Naturalist said that they
were not at all acted on by heat.

[If] they are Colored, it lessens very much
[th]e Value, but it's partly got rid of by
applying heat in a Close vessel

Diamond is a non Conductor of heat.

The Value of them increases very much
[wi]th the Weight of them

Coke is Made by heating in Close Vessels
Common Bituminous Coal.

Charcoal forms a very excellent Dentifrice
[in] a very fine powder -

Sulphur

Its Specific G: in its Native State is 2000 water being 1000 [illegible]

The Compounds of Sulphur without Oxygen are called Sulphurets. [illegible] Sulphur begins? [illegible] Oxygen at? [illegible] Farenh? [illegible]

The Acid: Nit: acts on Sulphur: so the Chlorin-G will, with which it forms a red Liquor Gas.

Sulphur begins to attract Oxygen at a temperature of of Farenheit

at 560, of Farent: it becomes an elastic fluid.

Sulphur is insoluble in Spirits of Wine [illegible]

100 Parts of it Compounds? [illegible] Carbon? [illegible]

May be obtained artificially by the decomposition of *Sulphuric Acid.*

Colour, *pale yellow.*—Sp. Gr. 2.033.—*Hard, brittle, insipid, insoluble.*—Very easily melted.—Sublimes in close vessels into *light yellow* flowers, formerly called *Flores Sulphuris.*

Burns with a *blue* flame, and by absorbing *Oxygen* from the Air, is converted into *Sulphureous Acid Gas, Sulphureous* or *Sulphuric Acid,* according to the proportion of this principle.—Similar effects are produced on it by deflagration with *Nitre.*

Is little affected by *Acids.*

Unites readily with the *Alkalies,* and also with the *saline Earths,* producing liver-coloured compounds (*Sulphuret of Potash,* &c.) which are soluble in *Water,* and may be decomposed by all the *Acids* (*Sulphur præcipitatum* P. L.)

When intimately mixed with certain proportions of *Potash* and *Nitre,* produces a compound which when gradually exposed to heat, explodes with great violence (*Pulvis fulminans*).

With *Nitre* and *Charcoal,* in mixture, it constitutes *common Gunpowder.*

Combines by fusion with all the metals except *Platina, Gold,* and *Zinc.*

Is insoluble in *Spirit of Wine,* but unites with *oily* matter of every kind, and with all the liquid *bituminous* bodies, into compounds of increased consistence (*Balsams of Sulphur*).

Order of attraction in the moist way, *Lead, Tin, Silver, Quicksilver, Arsenic, Antimony, Iron, Potash, Ammonia, Barytes, Lime, Magnesia, Unctuous Oils, Essential Oils, Æther, Spirit*; in the dry way, *Potash, Soda, Iron, Copper, Tin, Lead, Silver, Cobalt, Nickel, Bismuth, Antimony, Quicksilver, Arsenic.*

Employed principally in *Bleaching,* in the manufacture of *Sulphuric Acid,* and of *Gunpowder,* frequently also in *Medicine.*

Of Phosphorus.

Obtained, by decomposing calcined *Bones* by means of diluted *Sulphuric Acid,* evaporating the supernatent liquor to the consistence of a syrup, mixing it with powdered *Charcoal,* and distilling in the open fire; or by adding *Nitrate* or *Acetite of Lead* to common *Urine,* collecting the precipitate, mixing this with *Charcoal* and distilling as above.

is extremely Volatile, it will decrease the Weight of the Ther:
nsiderably. it has somewhat of an offensive Smell
es off the hand like Ether when applied –

f you add a little of this fluid to Oxygen Gas
it will ex[illegible] and by applying a Heat
it will detonate violently –
Nitrous Acid Gas it produces by applying
at a beautiful blue flame –
[illegible] – Sulphur enters into the Composition of Gun
powder

Sulphur is found in Sicily in its purest State.

Sulphur has a great effect of restraining the virulence
of these Poisons. When Sulphur is
combined with Alkalies they are turned
Sulphurets.

[illegible] Flowers of Sulphur [illegible]

[illegible] Carbonate of Potash [illegible]
[illegible] Sulphur [illegible]
[illegible] are Sulphuret of Potash [illegible] Acid is
added to it it gives off Sulphuretted Hyd Gas the Sulphur
precipitated alone

By throwing Sulphuret of Potash into Water the effect will be

Lac Sulphur is Made by precip.d a Sulphuret by an Acid.

By taking a Solution of Sulphuret of Potash & by pouring into it Sulphuric or Nitric Acid and you will form the Sulphur Precip.

Sulph. is Capable Combining with [illegible] [illegible] [illegible] forms with Combustion

It Should be kept in Green Bottles

Oily Matter is Capable of Dissolving all Sulph. by Boiling it in Olive Oil you form the Balsam of Sulphur. — [illegible] Sulphur

Sulphur is Widely diff.d thro' the earth and the Class of Veget. Called Gelwand [illegible] United with Hydrogen in Many Mineral Waters.. –

a Mixture of [illegible] Sulph 1 Part Carb. of [illegible] [illegible], Nitre 3 Parts the [illegible] [illegible] Detonates when heat is applied The Cause of explosion is not exactly ascertained.

The Sulph[illegible] containing Ammonia

[illegible] 100 Grains [illegible] of Sulph[illegible] [illegible] [illegible]
[illegible] with One oz [illegible] [illegible] [illegible]
[illegible] dissolved [illegible] the Ammonia

[illegible] effect of Sulphur is [illegible]
[illegible] effect of Ammonia [illegible]
[illegible] that of [illegible]

[illegible]phur [illegible] Oxygenating [illegible]
[illegible] that the [illegible] of [illegible]
[illegible] [illegible] [illegible] Sulph
[illegible] Hyd[illegible]
[illegible] [illegible] the [illegible]
[illegible]phur is got by heating the [illegible]
[illegible]phur

Sulphur will combine with Phosphorus.

Phosphorus

was accidentally discovered in 1677 -

[illegible] is of a [illegible] Color & semitransparent
Consistence that of wax & [illegible] in [illegible]
insoluble in water S G 1770
Phosphorus is undergoing decomposition when
exposed to light & air - at a temp. 110 of Fahr.
219 vapour at 265 it boils
it melts - in the slow combustion Pho-
[illegible] acid is formed in rapid combustion
Phosphoric acid is formed capable of uniting
with 3 1/2 proportions of oxygen
Phosph. can be obtained in Chrystalls - in that
but the farmers are very great - you may obtain
them Chrystalized by melting it & exposing it to [illegible]
[illegible] the water in which Phosph. is kept
should be as much as possible robbed of its air
[illegible] should not keep a large quantity in water as
in cold weather the water may freeze & [illegible]
[illegible] the phosphorus will absorb oxygen
[illegible] [illegible] a flame
Phosphorus may be exploded in any [illegible]
oxygen gas
When [illegible] solution of P in [illegible] exposed to the air
it becomes luminous

At the temp of 100 it burns & also [illegible] & [illegible]
[illegible] [illegible]

Phosphorus will burn most beautifully in oxygen Gas

Purified by cautious re-distillation, or straining it, when melted, through leather.

Colour *pearly-white. Semi-transparent. Waxy. Insoluble* in *Water.* Very *fusible.*

When exposed to air, at a low temperature, emits a white fume, and is luminous in the dark; if heated, burns with great rapidity; and in both cases acquires acid properties, *Phosphoric Acid.*

Decomposes the *Nitric Acid,* occasioning combustion by the sudden separation of its *Oxygen.*

By treatment with the *fixed Alkalies* or *Lime,* yields a permanently elastic fluid which explodes on admission of *Air (Phosphuretted Hydrogen Gas.)*

Dissolves in *Essential* and *Unctuous Oils, Spirit* of *Wine* and *Æthers.*

Unites by fusion with *Sulphur.*

Unites also with several of the *Metals,* and decomposes most of their *Oxyds.*

Used in the preparation of *liquid Phosphorus, Phosphoric Matches,* and portable *Phosphoric Bottles.* Attempts have also been made to employ it medicinally in small doses.

Compound Combustibles.

Found abundantly in the vegetable, animal, and mineral departments; some prepared artificially.

Consist principally of *Hydrogen* and *Carbon* variously combined.

May be divided into five kinds, *Alcohol* and *Æther*, *Fixed Oils*, *Volatile* or *Essential Oils*, *Resin* and *Bitumen*.

Of Alcohol.

Obtained from such organised substances, or their products, as have undergone the *Vinous Fermentation*, of which those containing *saccharine Matter* are alone susceptible.

This process materially influenced by *Rest*, *Dilution*, *Temperature*, and *Exposure to Air*.—Divisible into different stages, the *vinous* productive of Alcohol, the *acetous* affording Vinegar, and the *Putrid* generating Ammonia.

These changes promoted or retarded by various means, *Ferments*.

[illegible] [illegible] with [illegible] forming
[illegible]phurets

Phosphorus when burnt under water of Oxy-
gen is given to [illegible] the Red Oxyde of Phosph-
[illegible]produced. Put into a [illegible] [illegible]
[illegible] a little [illegible] of Potash [illegible]
[illegible] [illegible] a few bits of Phosphorus
[illegible] pour on a little concentrated Sulph-
[illegible] Light is instantly produced directly
[illegible] touches the Phosphorus & there is a [illegible]
[illegible] Phosphorus [illegible] with [illegible] of
[illegible] nitrate & [illegible] frequently with the
[illegible] of [illegible] [illegible] the
[illegible] is produced [illegible] [illegible]
Phosphuretted [illegible] of [illegible]
[illegible] [illegible] [illegible] [illegible]
[illegible] combines with Sulphur [illegible]
[illegible] under water [illegible] in various
proportions with Sulphur

Bottle may be [illegible] with Phosphorus,
Phosphuret of Lime
[illegible] yourself a Porcelain tube Put into it some
[illegible] of Lime and heat [illegible] and [illegible] Phospho-
[illegible] & the Phosphuret of Lime [illegible]
formed Phosphorus when heated with
readily ignites

[illegible] [illegible] [illegible] Coffee

Phosph produces strong effects when taken into the sy[illegible] it has caused [illegible] & then stomachs affirmed [illegible] the death, it should only be given in [illegible] [illegible] or mixed [illegible] with sugar. By dropping a little of spirit Oil on Sulph. it [illegible] be proved to [illegible] [illegible]

The Production of Phosphorus in commerce [illegible] [illegible] very great

Phosphorus unites with Combustion [illegible] with many other substances

Phosph has been obtained by simply distilling the [illegible] of patients. Teeth in the dead [illegible] [illegible] [illegible] Dangerous after [illegible] [illegible] Death. The Discovery of Phosphorus was an accident.
He collected a quantity of urine which is evaporated to the consistence of a syrup mixed with sand & Distilled [illegible] then [illegible] [illegible] a portion of Phosph. [illegible]

---

33 — If the [illegible] of [illegible] [illegible] with a ferment Fermentation at once [illegible] The [illegible] of [illegible] of wine [illegible] [illegible] [illegible] [illegible] & [illegible] in a Cellar. Port Wine contains a portion of Tannin. The Colouring matter of Port is principally from the [illegible] of the Grape. [illegible] [illegible] degree [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

31

... than both in contact with ...
which ought to be heated with ... ly. A retort ought to be made at the ... month, the neck of the retort ... put into water

... 8 Parts of Bone Ashes 3 ... of ... Dilute ... from it ... Ashes ... in ... for a few Days then filter ... by evaporation ...

... Glass of Phosphorus in ... with ... Charcoal & Put into a retort

... will not be quite transparent ... be ... by ...

Alcohol

Fermentation is always attended with more or less effervescence. All Substances containing Sugar are ... converted into Vinous Liquors. Thus vegetables ... Grapes & ... roots which contain a portion of ... farinaceous matter.

... of Sugar ... ferment with about ... gallons of water ... by abstracting a portion of the Sugar ... of Sugar. The ... the Temperature ... fermentation ... the more Spirit ... During the ... fermentation. Caloric is evolved.

... Consists of Alcohol ...
... Carbonic Acid ... is formed by ...

Alcohol is very inflammable and burns no residuum; if you put a little Gun Powder into a Small quantity of Alcohol and set it on fire, the gunpowder after the Alcohol has burned of its good, will explode.

Alcohol readily mixes with Water in any proportion, with a diminution of volume and an increase of heat. Shewing that the two fluids have a strong attraction for each other. By pouring Alcohol on a Solution of Sulphate of Potash, the Salt will be precipitated

Muriate of Lead. Silver are insoluble in Alcohol —

Sulphate of Lime or Selenite or Potash is quickly precipitated by alcohol. When dissolved in Water the alcohol having a stronger attraction for water than the Alcohol is decomposed

It does not act on Sulphur except in a State of vapour —

Fixed Oils as Olive Oil will not combine with Alcohol, but it will, when it is combined with Alkali. The flaming Alcohol may be made ... of different colours with Strontian

Alcohol is also a powerful Antiseptic and is used for the purposes of keeping Anatomical

Distillation from Sugar Cane produces Rum.

Repeated distillation and digestion on dried *Muriate of Lime* or on *Potash,* necessary to bring *Alcohol* to its utmost degree of purity.

When pure *colourless* and *transparent.*

Taste *hot* and *pungent.* Sp. Gr. 0.815.

Miscible with *Water* in all proportions.

Burns with a bluish flame, producing in combustion *Carbonic Acid Gas* and *Water.*

Undergoes singular changes in its properties by treatment with the different *Acids*; hence the preparation of *Æthers, Oleum Vini,* &c.

Dissolves the *Alkalies,* and many of the *neutral Salts,* particularly such as are deliquescent. Also dissolves *Soap,* and acts readily as a solvent on *Essential Oils* and *Resins,* on *Balsams* and on *Camphor*; hence the preparation of various *Spirituous Liquors, Tinctures, Varnishes,* &c.

Considered by *Lavoisier* and others, as a compound of *Hydrogen, Carbon,* and *Oxygen,* produced by the decomposition of the sugar, in the act of *Fermentation.*

Order of Attraction, *Water, Æther, Essential Oils, Ammonia, Potash, Alkaline Sulphurets, Sulphur.*

In general use for various *technical* as well as *dietetical* and *medical purposes.*

The Hydrometer is the instrument used to determine the Specific Gravity of Alcohol [illegible] the best weighs 700 Grains [illegible] [illegible] [illegible] is light in [illegible] [illegible]

Of Fixed Oils.

Obtained both from *Vegetables* and *Animals.*

From the *former* sometimes by boiling, but mostly by pressure, from certain *Fruits, Kernels,* and *Seeds,* hence called *Expressed Oils;* called also *Unctuous Oils.*

From the adipose membrane of the *latter,* of different colours and consistence according to the part, the age, and the species of animal from which it is taken, *Lard, Suet, Fish Oil.*

The difference between Animal and Vegetable Oils not exactly ascertained. The Animal in distillation furnish a peculiar acid, *Sebacic Acid.*

Both vary in the temperature at which they become *solid;* are insoluble both in *Water* and *Alcohol;* become *rancid* by keeping; yield, by distillation in close vessels, an *acid Phlegm,* a lighter and a denser *Oil,* (*Empyreumatic Oil,*) a large quantity of *Hydrogen Gas* mixed with *Carbonic Acid Gas,* and leave behind a small proportion of *Charcoal.*

Afford *Water* and *Carbonic Acid Gas* by inflammation in contact with *Air.*

By mixture with the stronger *Acids,* produce,

Sulphuric Æther is made by taking

equal parts of Alcohol & Sulphuric Acid,

these must be mixt cautiously & the

heat applied very gently.

As it is obtained in ye first instance

contains Sulphurous Acid, when you

Æther contains a greater proportion of

Hydrogen, and a smaller portion

of Carbon. Æther will not boil till

temperature of 200 of Farenheit's Thermom

Spec Gravity of Æther

the latter stage of ye Process we have

of Wine,

may obtain the Ol Vin: by taking in

first instance a larger portion of Sulphu

Acid in ye Process - when you will have

little Æther but a large quantity

Ol: Vini

small portion of Æther may be formed without

aid of heat by a Mixture of

Æther will not readily unite with Water which may be observed by lighting it on the surface of Water

It is one of the lightest fluids we have

It boils at 90 in the air & 20 below Zero in a Vacuum, Good Æther evaporates in [illegible] very quickly at 0 deg. below [illegible] the [illegible] [illegible] [illegible]

it is quickly decomposed by Chlorine, and Oxygenized Muriatic Acid — —

When the Æther is good, by putting a small of it, into Chlorine it will slightly detonate and the inside of y^e Vessel is covered with Carbon

This experiment should be made with Caution Danger is sometimes the result of it but not ordinar but this ought to be done Carefully

Æther has y^e property of dissolving a portion of Gold

Æther is also obtained by mixing Alcohol with Nitric Acid, but this should be done with Caution. -

It is extremely Volatile so that if exposed in Warm Weather you will observe a number of air bubbles

Nitric Æther also has the power of dissolving

Æther: Nitros: Made by 4 Parts of Alcohol and
part of strong Nitric Acid by weight
Draw them Continuously & draw off 3 Parts [illegible]
[illegible] a good deal of [illegible]
Spirit Æther Nitr [illegible] can get [illegible]
By Mixing Alcohol 2 Parts by Measure
and one part of Nitric Acid, this will
[illegible] the action of the Nitric Acid
[illegible] Alcohol.—

Muriatic Æther is not
[illegible] by employing the [illegible] of [illegible]
Alcohol Take [illegible] off [illegible]
[illegible] with Common Salt & [illegible] Acid

[illegible] Æther is
Produced by equal parts of Acetic Acid
and Alcohol.— [illegible]
[illegible] a good deal of Acetic Acid [illegible]
[illegible] up with Carbonate of Soda.
As general properties, the Acetic
Æther, resembles very much the other
Æthers. and is employed much in
Medicine.—

Fixed Oils

Some of them are thinned [illegible] most congeal at any common temperature [illegible] of their Character

Specific gravity less than that of water

Castor Oil is perfectly soluble in Alcohol free from water which may be promoted by the addition of a little Camphor

Fixed Oils undergo a change when exposed to the air they become thick & Ropy these are called fatty Oils being absorbing Oxygen from the air. In others the property of [illegible] them from Castor Oil [illegible] Oils are the oils from various seeds. The fat Oils by some degree become Drying by boiling the [illegible] in fat Oils

Sulphur is readily dissolved in fat Oils
And Sulph has considerable action on fixed oils
If you take fat Oil and merely boiling & drop in Concentrated Sulphuric Acid in to them [illegible] hydrogen is evolved or Acid drop [illegible] formed

None of the Vegetable Salts Decompose [illegible]

these Oils are therefore [illegible] which [illegible]
with Sugar or Honey, Fixed Oils [illegible]
found in Every [illegible] expelled from the [illegible]

in some instances, *saponaceous Compounds*; in others occasion *Combustion.*

Unite more perfectly with the *Alkalies,* more especially with *Potash* and *Soda*; with the latter, form common *Soap.*

Unite also into saponaceous compounds with *Barytes, Lime,* and *Magnesia.*

Have no action on any of the *Metals* except *Copper* and *Iron,* but assisted by heat dissolve most of the *metallic Oxyds,* and when separated again from these, are found to be soluble in *Alcōhol.*

Combine by the assistance of heat, with *Sulphur* and with most of the *Bituminous Bodies.*

Considered as differing principally from the *Volatile* or *Essential Oils,* in containing different portions of *Mucilage.*

Employed in *Painting, Varnishing, Soap-making,* in *Mechanics,* for *Fuel,* in *Diet, Medicine,* &c.

Of Sperma-ceti.

Obtained from the brain of a particular species of whale, (*Cetus dentatus* Lin.) thence called the Sperma-ceti whale; obtained also in small quantity from the oil of the same fish.

After refinement, *white, semi-transparent, crystalline, friable, insipid, inodorous.*

Differs chiefly from the fixed oils in being little altered by distillation, and not easily acted upon by *Acids* or *Alkalies.*

Supposed to have the same relation to *Unctuous Oils* that *Camphor* has to the *Essential.*

Used chiefly for making *Sperma-ceti candles*, and in the composition of *Ointments, Plaisters,* &c.

Of Bees-Wax.

Deposited by the *Bee* in the construction of the *Honey-comb.* Colour, *yellow.*

Very analagous to *Fixed Oils* in all its essential properties.

Becomes white on exposure to *Air,* or treatment with the *Oxygenized Muriatic Acid.*

Forms the basis of several *Cerates, Ointments,* and *Plaisters.*

Employed also in several of the *Arts,* but principally in making *Wax candles.*

Of Volatile or Essential Oils.

Obtained from most fragrant vegetables, by expression, or distillation with Water.

Alkaline Solution [illegible] [illegible] [illegible]

[illegible] 24 oz of Sod [illegible] [illegible] oz of [illegible]

[illegible] of water [illegible] [illegible] [illegible]

[illegible] [illegible] a bottle that [illegible]

[illegible] of water [illegible] [illegible] [illegible]

[illegible]

[illegible] soap in [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] is made by [illegible]

[illegible] [illegible].

[illegible] [illegible] a [illegible] soap

[illegible] may be [illegible] [illegible] by [illegible]

[illegible] hard soap [illegible] is [illegible] of

[illegible] in the preparation of [illegible]

[illegible] soluble in Alcohol [illegible] of soap [illegible]

[illegible] [illegible] [illegible] [illegible] for [illegible]

[illegible] [illegible] [illegible] [illegible] the [illegible].

[illegible] [illegible] [illegible] [illegible]

[illegible] by [illegible] [illegible] [illegible]

[illegible] kinds of soap [illegible] [illegible] [illegible]

[illegible] of [illegible] of [illegible] [illegible] on the

[illegible] of [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible] [illegible] [illegible] Days

[illegible] [illegible] Cub [illegible] by [illegible] Albert

[illegible]

[illegible]

[illegible] by [illegible] Lieutenant Albert [illegible]

[illegible]

n expressed Oils from they generally get
ame kinds. Sometimes found in the
uits of plants Stems or roots of they often
ing little

[illegible] Oil may be prepared [illegible]
ent or Potter [illegible] the best [illegible]
[illegible] without [illegible]
ing one part with [illegible] & [illegible]
[illegible]
Rosin is obtained by [illegible]
[illegible]
[illegible] Oil is either called [illegible]
[illegible] Oil

[illegible] of Oil [illegible]
[illegible]
by [illegible]
[illegible] the [illegible]
Oil from Poppy Seed which [illegible]
[illegible]
[illegible]
Drying Oils when [illegible]
[illegible] vegetable alkalies [illegible]
[illegible]
fixed Oil [illegible]
[illegible] of [illegible]

The Balsams some of them have a pleasant smell

Copal is a species of resin but this not soluble in Alcohol, but like the other Resins it is soluble in alkalies and Nitric Acid. The best Copal comes from . as it is not soluble in Water and very little to other substances, it forms a good Varnish, for Preparations &c

℥iss of Powdered Copal ℥vi of Ol: Terebinth: rect apply heat until the Ol: Turpentine boils gently then add gradually the Powdered Copal until you find the last portion is hardly acted upon at all

Taste *pungent.* Odour, colour, and consistence, *various.* Most of them lighter, some heavier than *Water.*

Thicken and become less odourous by absorbing *Oxygen* when exposed to *Air*; hence the supposed formation of *Balsams* and *Resins,* which differ chiefly in consistence and the occasional presence of *Benzoic Acid.*

Also affected by exposure to *Light.*

Sparingly soluble in *Water*; but readily so in *Alcohol.*

Volatile in close vessels, at or under the temperature of 212 *Farenh.* By repeated distillation lose their characteristic properties, and are brought nearly to resemble each other.

Highly inflammable when heated in contact with *Air.*

Decompose the stronger *Acids*; in some instances with such rapidity as to occasion actual *Combustion.*

May be united with the *Alkalies* and *Lime* so as to form *Soaps.*

Combine intimately with *Sulphur.*

Combine also with *Phosphorus, Unctuous Oils,* and *Camphor.*

Purity ascertained by solution in *Spirit,* or exposure to *Heat.*

Chiefly employed in *Medicine.*

Of Camphor.

Thought to be a *Volatile Essential Oil,* containing a large proportion of *Carbon.*

Exists in many of the fragrant plants, as *Lavender, Rosemary, Marjoram,* &c. but principally procured by distillation with water, from a particular species of laurel, (*Laurus Camphora* Lin.)

Requires certain additions in its subsequent refinement by sublimation.

White. Transparent. Friable. Taste *pungent* and *bitterish.* Specifically lighter than *Water.*

Evaporates completely if kept exposed to the *Air.*

Burns with a white flame, and is entirely consumed.

Sparingly soluble in *Water*; but readily so in *Spirit of Wine* and *Æthers,* in *Unctuous* and *Essential Oils.*

Dissolves both in the *Sulphuric* and *Nitric Acid,* without decomposition; by repeated dis-

Copal in many of its properties resembles
Amber. - Amber

 Camphor. [illegible]

Camphor

Camphor is found indispersed in the [illegible] of the [illegible]
[illegible] essential oils &c

[illegible] a temperature of 352 deg. of F. [illegible]
[illegible] if heated suddenly
Camphor is highly [illegible]: Carbonic Acid is produced
Camphoric Acid

Lighter than Water, it [illegible] readily [illegible] on
surface.

In warm weather it evaporates completely

It is very inflammable, and leaves no residuum
When burnt it gives off Carbonic Acid &
Camphoric Acid.

By repeated Distillation with Nitric Acid Camphor
[illegible] converted into a peculiar Acid

Alcohol Ether & Oil will dissolve it.
From Alcohol precipitated by Water, the
Water having a greater attraction for the Spirit
than the Camphire has. -

There is a kind of Camphor in [illegible] ether
under fixed Camphor

Camphor has been found in Many Plants
as Lavender Rosemary &c

Water will only dissolve 1/1000th Parts but
abundantly soluble by alcohol

By the intervention of Gum or Sugar Camphor
with water will form an emulsion

If a small piece of Camphor is placed on Pure Water
It will begin to move round therefied very qu
but if any portion of essential oil is added the
motion will be suddenly stopped this has
been satisfactorily explained.

By passing [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible]

Bituminous Bodies

They are either liquid or Solid & found
in many degrees of Purity. & [illegible] to
[illegible] [illegible] [illegible] [illegible] [illegible]

Naphtha. is an extremely inflam^ble Substance
found at Baku in the Borders of Caspian
& also in Italy lighter than Ether

Its Composed of Carbon & Hydrogen, Simple
exposure to the Air will Carry off a large
portion of y Hydrogen.

Petroleum or Tar

As the Carbon is increased it will more
readily combine with Alcohol

Mineral Pitch or Maltha

Resembles Common Pitch —

distilled harden it is Called Asphaltum
which will Melt & is very inflammable

The Main bulk of Jet is Asphaltum
It may be turned into various Shapes
as is Specified in Making ornaments

Camel Coal, is full black
Produced in Lancashire
100 Parts contain 72 pts of Carbon 22 of Maltha
but no Asphaltum (and earthy Matter)

When Distilled it affords an oil like Tar
and what is left will be Coke —
which Contains more Carbonaceous Matter & is
better than ye Coal..

100 Parts of Whitham 57 Parts of Carbon 4 of Maltha & Asphaltum
and nearly 2 Parts of earthy residuum — G

Naptha is remarkable from its fluidity & ... of the
other oily substances

tillation with the latter, is converted into a peculiar *Acid.* Artificial substance resembling *Camphor.*

Chiefly employed in *Medicine.*

Of Bituminous Bodies.

Found either liquid and devoid of colour, *Naphtha*; or more or less liquid and of a dark colour, *Petroleum, Barbadoes Tar*; of a harder consistence, *Maltha*; or perfectly solid, black, and of a compact or slaty texture, *Asphaltum, Jet, Coal.*

The more liquid Bitumens by continued exposure to *Air,* convertible into the more consistent, and all yielding similar products in distillation. *Coal* considered as a variety of *Bitumen.*—Origin and formation of *Coal.*—Artificial formation of *Bitumen* from *vegetable Matter,* by heat and pressure. In the different kinds of *Coal* there exists more or less *earthy* admixture, and often *Iron Pyrites.*

The *bituminous* bodies immiscible with *Water* and insoluble in *Spirit of Wine.*

Of Amber.

Nearly allied to the foregoing.

Found for the most part in irregular masses more or less transparent, and of a brownish or yellowish colour.—Specific gravity from 1.055 to 1.000. Emits a peculiar odour on friction and becomes *electric.* Melts at 550 *Farenh.* Burns with a whitish flame. In distillation yields *Water, Empyreumatic Oil,* (*Oleum Succini* P. L.) and a concrete *Acid.*

Insoluble in *Water* and nearly so in *Spirit of Wine,* also in all the acids, the *Sulphuric Acid* excepted, in the solutions of the *Alkalies* and in *essential* and *expressed Oils*; but the *Balsams* dissolve it readily.

Of the methods usually employed for rendering *Amber* transparent.

Is probably of *vegetable* origin.

Amber

[illegible] an inf. Substance it a brittle transparent [illegible] Substance

Specific gravity little more than that of Water when melted it becomes [illegible]

Water does not act on it, but alcohol will dissolve part of it. Alkalies will dissolve it also Nitric Acid. - it must be heated considerably like Copal before it can be used for a Varnish [illegible] [illegible] [illegible] [illegible] of Roasted Amber ℥24 ol Terebinth:

The Acid. afforded by the Distillation of Amber already spoken off. [illegible]

The Same process affords [illegible] Ol: Succini by repeatedly Distilling this it becomes

Amber abundantly found in Prussia [illegible] & eastern Shores also found

It is probable that Amber is formed from vegetable Substances which have been acted on by Sulphur

[illegible] [illegible] & Acid [illegible] to be [illegible] in [illegible]

Camphor
It is a volatile essential combined with a large portion of Carbon. Hyd. O & Ox

Coal

Coals are found in the earth seldom in Strata but in Seams. —

The thickness is mostly uniform the direction of them generally east & West.

The Seams don't run parallel with the Horizon. — In the County of   are the Deepest Seams of Coal: that nearest the Surface is Commonly the Worst. but this is not always the Case. —

a Species of Coal, called Wood Coal, is found in Devonshire near Exeter; it lies in Strata, but the Strata are not parallel to each other direction from east to West; there is evident traces of Wood in it.

When Carbon has been freed from $\frac{2}{7}$

The Character of Bitumen is very apparent in Turf & Peat,, the last found in Bogs

Ambergris was formerly supposed to [be] a bitumen but now known to be of Animal Pro[duction]
[illegible]
[illegible] parts of its consists of 53, of Adipocire
, Resin 11 Benzoic acid 5 of Charcoal
[illegible]
[it] has been in the Stomach of the Spermaceti whale, considered a disease of this fish
[illegible]

[It] is inflammable & softens in a Moderate heat, only Nitric acid will act on it strongly

[It is] used by Some as a perfume.–

Essence of Am[bergris]
[illegible] of Ambergris, ℥i of Sugar, a few gr of musk f℥ij/ʒx of Spirit Vin: rectif: this makes the Essence of Ambergris

[Sulph]uric Acid & Ether are dissolve it [whe]n Diluted it becomes fragrant

OF METALS.

Found generally in the clefts or fissures of stony or other strata, forming what are called *Metallic Veins*; or in indeterminate *Masses*; or in *Beds*; or *disseminated* through other substances.

In these instances they are either *native*; or *alloyed* with each other; or in different states of *Oxydation*; or *mineralized* with certain combustible bodies, particularly *Sulphur*; or lastly, combined with one or other of the *Acids*.

Different processes therefore commonly necessary for obtaining them in their separate and proper forms; as, *Pounding, Washing, Roasting, Amalgamation, Reduction,* and *Refinement.*

When pure, easily distinguished from other bodies by their united properties of *Weight, Opacity* and *Splendour,* as well as by their power of conducting the *Electric Fluid.* Great specific *Weight,* however, is not a character common to all *Metals.*

Some remarkable for their *Ductility,* or *Malleability,* or both; others for their comparative *Brittleness*: hence the *common* though *inaccurate* distinction into *Metals* and *Semi-metals.*

Differ also from each other in their comparative *Hardness* and *Softness:* when hardened by mechanical extension, may be made soft again by exposure to red heat—*Annealing.*

All *fusible* in close vessels if heated to their respectively necessary degrees ; are convex when in fusion, and in cooling disposed to *crystallize.*

Some, particularly *Iron* and *Platina,* grow soft before they melt, and hence are capable of being united by the operation of *Welding.*

Some, as *Platina, Gold* and *Silver,* remain *fixed* during fusion ; others, as *Quicksilver, Arsenic, Zinc* and *Antimony* are *volatile* or convertible into a state of *Vapour.*

Variously affected on exposure to *Air,* by which in some instances they are merely *tarnished,* in others deprived of their metallic properties more completely, being converted into a state of *Oxyd :* hence the utility of *Tinning, Silvering, Gilding,* &c.

All, except *Platina, Gold* and *Silver,* still more readily *oxydated* by the united action of *Air* and *Heat*; hence their division into *Noble* and *Base* metals. The circumstances in which these differ from each other in their *Oxydation* are ; the comparative facility with which they become *oxydated,* the temperature required for that pur-

To know Whether an Ore contains any Metal
... by means of a piece of Charcoal, and
putting a little of the Ore into a hole in this
Charcoal, and likewise a little black flux
and apply heat & you will distinctly
... Metallic Globules — —

The Ductility & Malleability differ very
much: the most remarkable Metals for
this property are Lead Iron and es-
pecially Gold — Platina likewise
These are all capable of being drawn out
into a Wire, and beaten into an extreme
thin Sheet. The thickness of Sheet Gold
according to experiment is not found
to exceed one 28000th part of an Inch
Silver and Quicksilver when cooled to the
freezing temperature, will be found
ductile & Malleable —
Antimony Bismuth &c are not found
to poss. these properties remarkably —

They differ also in Point of hardness —
... we know Iron when Converted into Steel
... in the Case of the Instrument called the file
... our Coins are alloyed. Thus the Silver
... Gold are mixt with an inferior Metal

by exposure to heat we are able to extend into a sheet many Metals which would Crack if heat was not applied. This is Called the Process of Annealing.
It is often of importance in Constructing of various Machines to know, the degree of hardness of a Metal. Dr Babington has an instrument to effect this given him by Mr Pepys—

Metallic bodies generally are Capable of fusion but they differ in the respect to the degree of Temperature, Carrying when in fusion and on Cooling are disposed to Chrystallize, Lead will fuse much more easily than Silver but this last is more easily fused than Iron
Platina requires an intense heat to fuse it.

In Cases where Solder is applied it is right that it should be more fusible than the Substance to be Soldered.

you can't by fusion combine Iron
with Quicksilver,

If you wish to separate any two
metals, as Iron with Copper you
must expose it to a degree of heat

Some of metals as Platina & Iron
become soft before it becomes fused
this is very useful as it renders
them capable of being united by
application of con[illegible] or (what
is called Welding) this is done continu-
ally by Blacksmiths. When the
Blacksmith has heated the Iron
he uses sand which acts as a
flux. Thus the solderer uses Borax
which converts the metallic oxyde
into a state of glass =

you can't take Oxyde of Zinc, and mix it
with a flux without excluding it from
air, otherwise you will have Flor. Zinci
but it be done in a retort (a close vessel)
metallic Bodies are effected by exposure
to air Gold Platina & Silver are not
acted on. but we find Copper Iron
[illegible] are affected. hence the
utility of Tinning, Silvering and Gilding
[illegible]

We can gild on brass, copper, & silver

When Lead is Melted its surface exposed to
ye Atmosphere it will form an Oxyde.
Iron may be melted very readily by means
of Oxygen Gas. Copper Burns in Oxygen Gas
with a Green flame
The Most effectual modes of Oxydating Metals
is by means of an Acid. Combined with
Water, thus Concentrated Sulphuric Acid
will scarcely act on it, but very strongly
when diluted, the reason of this is owing, it is
said to a predisposing affinity, of the water
The Acid is the Solvent of the Oxyde not the Metal
When a Metal is brought to a State of Oxide
its capable of forming with the Acids Neutral
Salts
No Metal can be dissolved in Acid excepting when in a State
Oxyde –
The ~~Oxyde~~ Metal becomes sometimes insoluble in Acid by Containing
too much Oxygen – this is the Case with Peroxyde
Arsenic and Mollyb. & Chrom are capable
combd with enough Oxygen to bring them to the State
All Metallic Oxydes may be made again
Regulus, or in its metallic State.

It may also may be brought into its metallic
State by Chemical affinity. thus the Nitrate
of Bismuth decomposed by Water it
having a stronger affinity for Acid than
the Bismuth

pose, the quantity of *Oxygen* which they respectively imbibe, the force with which they afterwards retain it, and the phenomena which they present during *Oxydation*.

Of *perfect* and *imperfect* metallic oxyds.

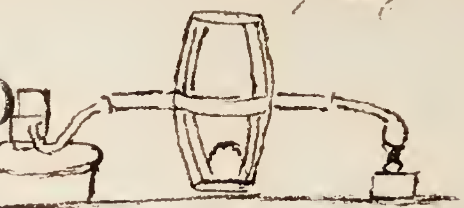
Metallic Oxyds, however produced, vary in their properties, not only from each other, but also from their respective metals. Those of the volatile metals much more fixed than the metals themselves:—Some capable of being decomposed or deprived of their *Oxygen* by heat alone, as those of *Platina, Gold, Silver,* and *Quicksilver* —Such as are not decomposed by the simple application of heat are *vitrifiable*; hence the necessity of *Fluxes.*

Remarkable for the *Colours* and sometimes for the *Opacity* which they communicate to *Glass*: hence the preparation of *Pastes* in imitation of precious stones, and also the preparation of *Enamels.*

Metals also capable of being oxydated by the decomposition of water—Few of them at a common temperature have any considerable action upon *Water,* in general therefore void of *Taste*; some however when aided by a red heat readily decompose it, and are thereby converted into

Oxydes of Tin & Lead soluble in Soda, Oxydes of Copper & Cobalt soluble in Ammonia

Water may be decomposed by being made to pass thro' red hot iron as in this Apparatus



Oxyds: hence the explanation of their effects on various other fluids.

Metals also capable of being oxydated by acids—Previous *Oxydation* necessary to their combination with acids (*Metallic Salts.*) Hence, in their solution, the partial decomposition of the *Acid* itself, or of the *Water* by which it is diluted; and the consequent evolution of *Sulphureous, Nitrous* or *Hydrogen* gas.

In some instances they are furnished with so large a proportion of *Oxygen* as to become *insoluble,* in others acidified. (*Acid of Arsenic, of Molybdena,* &c.)

Metallic Salts for the most part possessed of *Colour* and more or less *Corrosive.*

The *Acidifiable Metals,* and those, the *Oxyds* of which have a disposition to combine with *Earths* and *Alkalies,* may be readily *oxydated* by these through the medium of *Water.*

Many *Metallic Oxyds* soluble in solutions of the *Alkalies,* forming with them permanent compounds. The partial decomposition of the *Oxyd* by the *Alkali* sometimes necessary to this.

Neutral Salts, acted on but slowly by *Metals* unless aided by *heat,* which, by assisting to decompose their acids, *oxydates* the metal and renders it combinable with the *Alkali.*

e Metallic Solution can be decomposed
y Alkalies & the Oxydes precipitated. a Solution
Bismuth decomposed by water alone
ur a little ammonia on Verdegris (Oxyde of
pper) and y Verdegris will become decom
sed. A Slip of Copper immersed in
trate of Qk Silver will become covered with
oat of Quicksilver, If a Slip of Iron be
t into Nitrate of Copper it will become
ered with Copper - - It can be removed by
Acids - there is a proportionate quantity of iron
olved in y and also therefore there is an exchange
e may be als - coated by Nitrate of Quicksilver when put
t is Metals of Capable of Combining with Simple Inff: Substn:
us Hydrogen Gas will dissolve of portion of Iron
Steel is a Carburet of Iron.
Metals except Gold & Zinc will Combine with Sulphur
lphuretted Hydrogen Gas have a Considerable
tion on Metals, it will tarnish Silver
rticularly, and to this Gas, is to be imputed
the readey tarnishing of Silver in Shops
tals will Combine with each other by Fusion forming
loys, which is always harder & more brittle than either of
Separate Metals, Soldering depends
this property of forming Alloys -
ismuth 8 Parts, 5 Ps of Lead 3 Parts Tin, these
tted together are capable of dissolving in
ling Water, if Quicksilver be added its more
sable

The Caustic effect of Oxydes seems to depend on their yielding their Oxygen to ẏ Animal fibres.

The Classification of Metals is of very little consequence
ordinary my adopt
The Best is to be divided into 2 Classes. those which
[illegible] ẏ Alkalies & earthy & Earth [illegible] by heat
[illegible] or
2 those which Can be deprived of their Oxygen, by
carbon or heat alone. The last might be Subdivided
into the Malleable Metals & Brittle
Gold Platina Lead Nickel Zinc ... Palladium Mercury
Iron &c
Cobalt, Chrome Arsenic Bismuth Antᵞ Manganese
Tellurium Tungsten Molybdenum Columbium or
Tantalium —&c

Dalton Wollaston &c think that Oxygen unites
in certain proportion,

Within these last few months experiments have
made to shew that ẏ Same law prevails in the
vegetable Kingdom as in the Acids &c

The 1 Calcium Strontium and a considerable num

The 6 last have not been obtained in their pure st

The 2nd ~~are 6~~ they ~~have~~ are very numerous

[Me]tallic Oxydes are employed as the Colouring
[m]atter in Making Pastes &c — The Oxyde of
[Co]balt

[Th]e Oxydes of Metals are poisonous which are
[n]ot in their regulin state — therefore
[th]e Metals that are poisonous owe their
[de]leterious effects to the Oxygen

[The] union of Metal with the Oxy muriatic Acid

[The]re is every reason to believe in our present
[st]ate of Knowledge that metals are Simple bodies

[It i]s a question whether oxygen ever Combines
[with] metals in determinate proportions only

Platina

In Spanish means Silver, called Platinum by Dr Thompson, It is not capable of Oxydation therefore classed with Gold & Silver

Not more than 60 years since introduced into this Country

Platina was for a long time supposed to be peculiar to South America

The natural history of it imperfectly known

Always found accompanying Gold —

The grains in which it is found are [illegible] called [illegible]

They are frequently intermixed by Magnetic Iron in [illegible] portions of Iron being mixed with them

Platina but seldom found in large pieces, one [illegible] in [illegible] large size [illegible] found in 18[illegible]

it weighed.

Platina in its [illegible] form is [illegible] the [illegible] [illegible] [illegible] [illegible] [illegible] of Pure Platina [illegible] [illegible] [illegible]

Metallic Oxyds already formed sometimes combine with *Neutral Salts*, and produce with them triple compounds.

Iron the only metal capable of combining with *Charcoal* ; but this, and almost all the others, or their *Oxyds*, unite readily with *Sulphur*, their common mineralizer : many also combine with *Phosphorus*, and form fusible compounds.

With very few exceptions they unite with each other by fusion in all proportions.

Metallic bases of the earths and alkalies. General history of that discovery.

Classification of metals.—The metals at present known are the following ; *Platina, Gold, Silver, Quicksilver, Lead, Copper, Iron, Tin, Bismuth, Nickel, Arsenic, Cobalt, Zinc, Antimony, Manganese, Wolfram, Uranium, Molybdena, Titanium, Tellurium, Chrome* and *Columbium.*

Of Platina.

Brought from *South America*, in small grains of a dull silver colour, and commonly mixed with

1/4 ([illegible] but as much as 7/8 in 3, & found sometimes more than this

Quicksilver, Ferruginous Sand, particles of *Native Gold,* and no less than *four new* discovered *Metallic Bodies.* Found also sometimes, though rarely, in lumps—Bed and matrix unknown.

Manner of purifying, by fusion with *Phosphorus;* or amalgamation with *Quicksilver,* and solution in *Oxy-muriatic Acid*—Wrought in the large way by repeatedly melting with *Arsenic* and *Potash,* and subsequent roasting and hammering.

When pure, of a *Silver white* colour, inclining to *Iron-grey.*

Malleability and *Ductility* intermediate between those of *Gold* and *Silver*—*Hardness* greater than that of either—*Tenacity* next to *Copper*—*Specific Gravity* in its native granular state 17,7; in its malleable state 21,3, but varying a little according to the degree of compression.

Extremely difficult of *Fusion;* but when urged by an intense heat, becomes capable of being *welded,* though imperfectly.

Less disposed to *Tarnish* than either *Gold* or *Silver* on exposure to air—and not *Oxydable* by it even under the strongest heat; but may be reduced to a powdery *Oxyd* by the *Electrical Spark.*

Platina is Capable of being brought to a
state of fusion by burning it in Oxygen
   Iron when burnt in Oxygen
produces a very pretty appearance

Dissolve the by Nitro Muriatic
& precipitate it by Sulphate of Iron.
Platina not acted on by Acids excepting by
Nitro
Oxymuriatic Acid & Oxymuriatic Acid
When dissolved in Nitro Muriatic acid may be precipitated
Muriate of Ammonia
The Muriate of Platina may be Chrystal
lized
Nitro
When Platina is dissolved in Oxymuriatic
Acid it is Capable of being precipitated by
Solution of Muriate of Ammonia

having obtained this Salts you may

quite Malleable.

Purchased in Bars at 15s ~~Oz~~ In Grains 3 or 4 Shillings Oz;
The Color of Pure Platina is a sort of a whitish grey
very Ductile & Malliable Pressed may be into Plates & drawn into ~~Plat~~ wire.
ness
~~Hardly~~ scarcely inf to iron will take a fine polish
Dr Marcet has an Eighteen Penny piece of its which is twice the
weight of a Silver one

~~Both Soda &~~ Potash will precipitate Plati
but Soda does not ~~not~~

The Specific Gravity of Mall: Platina is $21 \frac{3}{10}$ th

Dr Wollaston succeeded in drawing a wire of P. 1/10000 part the
inch in Diameter, & which supported 6, 1/3 rd without br
but Dr W succeeded in drawing one 1/18000 part of an i
(Silver its Sp: Gravity only 11) The wire in the Operation of dr
the former is covered with Silver which is dissolved in Nitrous A
Solutions of Muriate of Platina decompos
by the Muriate of Tin & other Metallic Salts
The Muriate of Tin imparts to it a bright red c
or rather a yellow. The Action of Caustic Alk
at high Temp: is very obvious therefore can't be u
in all cases of analysis

Platina by fusion is Capable of uniting
with many Metals, forming alloys i
Gold & Lead & Silver.
its not Capable of Combining with Sulphur

Platina is not much used in the Arts on
account of its high Price – it makes
exceedingly serviceable Crucibles on account of the
difficulty of fusion in Analytical Chemistry. Evap
dishes are made of it for small experiments
Platina is used for the touch holes of Guns
Gold used to employed for that purpose
but its much softer than Platina

Mirrors for reflecting Telescopes are sometimes ma
of Platina

Platina Vessels have been used lately
very much by Manufacturers - in
the preparation of Vitriolic Acid.
They use Glass vessels but they are continually
breaking & are very expensive the Place the
Platina vessel on the fermentation Sand Bath -
The Metallic Glazing which coats
Earthenware Vessels, is made by the
Oxyde of Platina - this glazing has a
greyish white color

Platina may be fused by urging the flame of a Spirit
Lamp by means of Oxygen Gas. it is melted in this way
with extreme facility. it was some time ago considered
infusible.

Platina at a white heat possesses the valuable property of
welding

Platina in being capable of being laminated therefore
very useful in conducting ... assays. when
made into the Shape of a Spoon Tunnel Tongs are
made also of Platina which are very useful

Soluble only in the *Nitro* and *Oxy-muriatic Acids,* to which it communicates at first a *yellow,* and afterwards a deep *reddish brown* colour.

Precipitable from its solutions in these by the *Alkalies* and several of their compounds—With *Muriate* of *Ammonia,* as with many of the others, it forms a *Triple Salt,* which on being submitted to an intense heat, and strongly hammered when in a state of incandescence, furnishes the pure *Metal.*—Precipitable also by many of the other metals and their solutions, more especially by *Tin.*

In its metallic state is not acted on, unless exposed to very high temperatures, by *Earths* or *Alkalies,* or any of their compound salts, except the *Nitrate* and *Oxy-muriate* of *Potash,* by which it may be superficially *oxydated* in the dry way.

Has no affinity with *Sulphur;* but, like *Gold,* is soluble in *Alkaline Sulphurets*—Combines readily with *Phosphorus.*

When pure, amalgamates intimately with *Quicksilver,* and unites by fusion, in different proportions, with most of the other *Metals*—most easily with *Zinc*—with *Copper* produces a golden-coloured, hard and durable compound, which is malleable, close-grained, and susceptible of a fine polish—remarkable for giving a

considerable degree of toughness to *Cast Iron.* With *steel* forms a compound incapable of being touched by the file.

Order of attraction, in the moist way, *Æther, Muriatic, Oxy-muriatic, Nitric, Sulphuric, Arsenic, Fluoric, Tartareous, Phosphoric, Sebacic, Oxalic, Citric, Formic, Lactic, Acetic,* and *Succinic Acids*; in the dry way, *Arsenic—Gold—Copper — Tin — Bismuth — Zinc — Antimony—Nickel—Cobalt—Manganese—Iron—Lead— Silver—Quicksilver*—and *Sulphuret* of *Potash.*

Use as yet, principally confined to *Chemical* and *Philosophical* purposes. Employed to make the touch-holes of guns—likely to be soon more extensively used.

Of Iridium, Osmium, Rhodium, and Palladium.

These four metals always found mixed or combined with crude platina. *Iridium* and *Osmium,* discovered in the black powder which remains undissolved after the action of nitro-muriatic acid on crude platina; and *Rhodium* and *Palladium* obtained from the solution itself.

Iridium first found in Mr Tennant's
separation it from bl^k powder caustic alkali
muriatic acid
properties are dissolve in all acids but
in acid: Muriate..

Metal is reduced by heat alone not obtained
metallic: mass but in a spongy mass.
been fused by the Galvanic Battery -

Osmium & ~~Palladium~~ Iridium.

Osmium is obtained by heating the black pow
in Silver crucible

If a gentle heat be applied the Oxyde evolv
volatilize

a Solution of Oxyde of Os: is colorless & does n
redden vegetable blues If heat is applied the
Oxyde may be volatilized from it. it is volatil
at a lower Temp: than any other Oxyde of Meta

Os: has never been got in Pure Metallic form
only in form of a Black powder

Rhodium found in nitro Muriatic Solu
discovered by Dr Woll: precipitated by the
intervention of Muriate of Soda

Called Rhodium from Greek on accoun
of the rose color of its Salts

Pure Rhodium is White

Specific Gravity only 11

Palladium may be got either from the sam
Solution by Precipitating Mercury
Precipitating Palladium as Prussiate
100
100 Grains of Platina only gives ½ a Grain of
Palladium
In external appearance it resembles Pl:
atina it is very malleable more fusible
than Platina Minerals acids do not act on
it
It combines with a sort of metals forming
alloys Dr Woll: discovered it a few years
ago first

Solutions of *Iridium* varying in colour according to the degree of oxygination of this metal—How obtained pure. Soluble in acids, and especially in the muriatic. From its combination with this acid, may be obtained pure by heat alone.

Osmium, thus called from its peculiar smell. How obtained. Has never been procured in any other state than that of oxyd.—This oxyd very volatile and soluble in water. From this solution (which is colourless and transparent) the metal can be obtained in the form of a black powder. General properties of this substance.

Rhodium, thus called from the rose colour of its solutions. How separated from crude platina, and obtained in its reguline state. Its general properties.

Palladium, how obtained in its metallic state. Its general properties. Lately found in Brazil in grains of pure Palladium *mixed* with Platina, but not *alloyed* with it.

Of Gold.

Though less abundant, yet occurs more generally than most of the other Metals.

Found, either alloyed with a small proportion of Silver, Copper, Iron—*Native Gold*; or, combined with Sulphur, Antimony, Arsenic, Lead, Iron and Silver—*Grey Gold Ore*; or, with Bismuth and Sulphur—*White Gold Ore*—*Aurum Graphicum.*

Manner of collecting it from its ores.

When pure, of a *bright yellow* colour; *soft*; *inelastic*; *flexible*; very *tough*; *ductile* and *malleable* to an extraordinary degree; not *sonorous.*

Next to Platina the *heaviest* of the metals; its speeific gravity when uncompressed being 19.30.

Scarcely *tarnishes* even by continued exposure to air or moisture.

Melts soon after becoming red hot, or at 32° *Wedgw.*—5237 *Farenht.*—Whilst in fusion, of a *sea-green* colour.

Though unalterable in the common fire, may, by a more intense degree of heat, be *volatilized*, or imperfectly *oxydated.*

Crystallizes in cooling, into quadrangular pyramids.

If fused by the lowest degree of heat required for that purpose, becomes afterwards *brittle*—becomes also *hard* and *brittle* by compression; hence the necessity of *Annealing.*

Gold

[illegible] considered above all other Metals —
[illegible] account of its Ductility Malleability
and its not being acted on by the
[a]tmosphere. —

[i]t exists in largest quantities in Mexico
[H]ungary. Peru &c

[i]n[?] vicinity of [illegible] in Ireland it is
[fo]und

[It is] found in flattened fragments of Considerable
[ma]gnitude

[It] has been discovered in an imperfect chrystall[ine state]
[bu]t more frequently found in Capillary State &
[mor]e frequently in the form of Dust.
[Te]llurium contains some gold
[If] you mix Gold & Silver Leaf together and
[pu]t it into Nitric Acid you will find the
[Sil]ver acted upon but not the Gold.

[A grain] of Gold may be extended 13000 Miles in length

[Gold whe]n united with Silver may be separated by pouring
[on i]t Dilute Nitric Acid

[Spe]cific G: of Gold 19 & $3/16^{th}$.

[Gol]d is very ductile so that a wire $1/16^{th}$ of an inch in
[di]ameter will support

When Pure requires a White heat for its fusi[on]
but when impure it will Melt at a red heat.
It Can't be Oxydated — only by the Galvanic Batt[ery]
Gold may be Melted by means of a Spirits Lamp wh[en]
urged by a Stream of Oxygen Gas. as Platina may.
The Solvent of Gold is the Nitro Muriatic Acid
which is formed of Acid: Nit: 2 Parts. Acid: Muriat[ic]
Part
Soluble in Oxymuriatic Acid

Solutions of Gold are of a rich Color

They are decomposed by y Alkalies and the
famous Compound called —
Fulminating Gold is formed by precipitating
a Powder, by Ammonia, from a Solution of gold in
Nitro Muriatic Acid.
In the preparation of it the heat

The Powder Should be placed on a card and held o[ver]
a lamp when it will explode violently. The explosi[on]
is owing to the Sudden formation of elastic Matter.
In precipitating y Powder of Cassius. is form[ed]
by putting Tin into a Solution of Gold. Both th[e]
Oxydes are precipitated in the form of a purple po[wder]
Also precipitated by the Sulphate of Iron in th[e]
State of pure Gold but its not bright but can be
made so by means of heat & Drying it. The S[ul-]
phuric will not precipitate the other metals on[ly]
Gold.

Gold has so little attraction for Oxygen that even l[ight]
alone will reduce the Gold into its Metallic State

y Slow cooling Gold it will Chrystallize.

n attraction of Gold for Oxygen is so weak that
acids Scarcely effects its Solutions.
Solutions of Gold are very corrosive they
e precipitated by Alkalies

e Solutions of Gold are Decomposed & the Gold
ecipitated in its Metallic form by some of
Combustibles.

Gold forms Alloys with most of the Metals

With Silver in

The Coin of this Country consists of 1 Part of Copp
to 11 of Gold

℥i of Gold is worth intrinsically £3-12-6.

Gold unites with Quicksilver with great ease
forming an amalgam of a yellowish white
color this is much used in Gilding:

Gold Leaf affords another means of Gilding
it is applied to wood with Size

Glass is Gilded by

In the form of Gold leaf, is converted by *Electrical Explosions* into a *purple Oxyd;* and when ignited by the *Galvanic Fluid,* burns with *vivid white* flame, inclining to *blue.*

Like Platina, *soluble* only in the *Oxy* and *Nitro-muriatic Acids,* without effervescence; and in the solutions of *Alkaline Sulphurets*— Its acid solutions of a *yellow* colour and *caustic,* stain the skin *purple,* and, when evaporated, yield deliquescent crystals, which like the oxyds of this metal are decomposed by simple heat.

Gold separable from its solutions by *Æthers, Essential Oils, Phosphorus, Hydrogen Gas, burning Sulphur,* &c. May likewise be precipitated by all the *Alkalies,* and *Earths* in the form of a *yellow Oxyd,* which by exposure to light is partially decomposed, and becomes of a *purple* colour, and no longer soluble in acids.

The precipitate by *Ammonia* long known for the property of exploding with great violence when exposed to a moderate heat (*Aurum Fulminans.*)—This an *Ammoniacal Oxyd,* the explosive power of which depends on the double decomposition which takes place between the *Oxyd* and the *Ammonia*; hence the effects of exposing *Aurum Fulminans* to a gentle heat, or

of mixing it with *Oil* or *Sulphur,* or of heating it under strong *Compression.*

The precipitate of Gold by *Tin—(Purple Powder of Cassius,)* proved by the experiments of *Pelletier* to be an intimate mixture of *Oxyd of Tin* with imperfect *Oxyd* of *Gold.*

Gold distinguishable from Platina, by being precipitable from its solution by *green Sulphate of Iron*; but not by *Muriate of Ammonia.*

Its *Oxyds* unite by means of *Alkalies* with the *vitrifiable Earths.*

Has no affinity in its metallic state, for either *Sulphur* or *Carbon*; but unites with a small proportion of *Phosphorus,* and thereby becomes *paler,* and more *fusible.*

Combines with all the *Metals* in various proportions, acquiring different shades of colour and hardness, according to the quantity of alloy.

With *Copper* assumes a deeper colour and becomes more fusible, harder, and more elastic.

Amalgamates readily with *Quicksilver* ; hence the art of water-gilding, and manner of collecting it from its ores, as before mentioned.

May be freed from admixture of imperfect metallic matter, by fusion with *Lead,* or *Bismuth* under free access of air ; hence the process of Cupellation.

-ntrinsic Value of pure Gold is £3-17-6
- Annum -

-leaf is Gilded by wetting the Part with -
-lution of Borax and heat afterwards
-plied

- not on account of Color that we use the
-lor of Gold but on account of its not being
-ted upon by air & moisture

Most easily and effectually separated from *Silver* by diluted *Nitric Acid:* hence the process of *parting*.

Order of attraction in the moist way, *Æther, Muriatic, Oxy-muriatic, Nitric, Sulphuric, Arsenic, Fluoric, Tartareous, Phosphoric, Sebacic,* and *Prussic Acid, Potash, Ammonia*; in the dry way, *Quicksilver, Copper, Silver, Lead, Bismuth, Tin, Antimony, Iron, Platina, Zinc, Nickel, Arsenic, Cobalt, Manganese, Sulphuret* of *Potash*.

Used extensively in the construction of *Utensils*, and different kinds of *Ornaments;* in *Enamelling, Gilding, Dying, Soldering*. &c.

Of Silver.

Found, 1*st*. united to a small proportion of Gold, Copper, or Iron, *Native Silver*;—2*d*. in alloy with Antimony, or with Antimony, Arsenic and Iron—*Antimoniated* and *Arsenical Silver Ores*; 3*d*. mineralized by Sulphur—*Vitreous Silver Ore;* 4*th*. combined, in the state of oxyd, with oxyd of Antimony and Sulphur—*Red Silver Ore;* 5*th*. with Lead, Sulphur, Antimony, Iron, Alumine and Silex—*White Silver Ore;*

6th. with Muriatic Acid, Oxyd of Iron, Alumine, and a little Sulphuric Acid—*Horn Silver Ore.*

Manner of extracting it from its ores.—Purified by *Cupellation* or reduction from *Muriate of Silver.*

Colour *white*—has neither *Smell* nor *Taste*—is less *ductile* and *tenaceous* than Gold; but *harder*, more *splendid* and more *opake*—*Elasticity* between *Gold* and *Copper*—very *sonorous*—*Specific Gravity* from 10,253 to 11,091.

Tarnishes on exposure to air, and becomes occasionally encrusted with *Sulphuret of Silver.*

Melts below a white heat, or at 28 *Wedgw.* =4717 *Farenh.* Is very *brilliant* when in fusion—and in cooling, *crystallizes* into quadrangular pyramids or octahedrons. By intense heat may, like *Gold,* be *volatilized* and partially *oxydated.*

By *electrical explosions* is converted into an *Oxyd* of a greenish grey colour—by the *Galvanic Fluid* burns with an *emerald-green* flame.

Its *Oxyds* decomposable by *Heat* alone.

Most readily *soluble* in *Nitric Acid*—the solution *bitter* and *corrosive*—stains the skin and other animal substances *black.*

Upon evaporation yields a crystallizable salt, susceptible of watery fusion *(Argenti Nitras*

[The] Vitreous Silver ore is a Sulphuret of Silver

[Th]e red Silver Ore is a Compd of Antimony Silver [and] Sulphur

[Th]e Gray Silver ore is a Compd of Lead Silver & [An]timony.

[Th]e Horn Silver is the form of a crusts on a piece [of] Quartz

[Th]e Extraction of Silver from its ores is not difficult

[Sil]ver is of a Pure white Color but Tarnishes readily [no]t from Oxygen but from Sulphur

[Pu]re Sil: very Malle: The finest Silver leaf being [1/10]000th Part of an inch in thickness

[Its] Ductility is great but less than that of Gold [Pla]tina & Iron

[It m]elts at 22 and 23 of Wedgwoods Pyrometer

[Wh]en fused may be made to chrystallize in Tubes

[Sil]ver leaf may be Oxydated like Gold by Galvani[c] [B]attery

The Sulphuric acid to act on Silver requires the assistance of Boiling

Solutions of Argent: Nit: on exposure to light deposits black particles which is Silver almost in a Metallic State.

+ Silver is evaporated to dryness it forms the Luna Cornea.

The Silver may be obtained pure from the Luna Cornea by heat.

The Luna Cornea appears to consists of 19 pts of Acid to 81 of Silver —

When the Luna Cornea is Melted.

Muriatic Acid has scarcely any action on Silver but will precipitate it from Solution,

Nitric Acid the most powerful Solvent for Silver but its necessary it should be Diluted with water. this is remarkable, numerous bubbles in which is owing to decomposition of the acid in Contact with the Silver & Nitrous Gas is evolved
Nitrate of Silver is formed. if the Solution was evaporated to dryness.

Solutions of this salt when exposed to heat will Crystallize & hold a large proportion of water of Crystallization
When its exposed to heat its fuses and is Converted into Argent:, or Lunar Caustic.

Muriatic Acid readily unites with its Oxydes Silver & precipitates them. When the Muriate of Nitrate of Silver blackens in exposure to the Atmosphere,

Nitrate of Silver decomposed by other Metals was if a Solution of this Salt be applied to plate of Copper it became coated with Silver

Arbor Dianæ is formed

Silver like Gold is precipitated from its Solutions by. –

Fulminating Silver is made by precipitating by Aq. Calcis, and washing it with Ammonia in Solution
It explodes on ye slightest friction or heat being applied to it. The explosion is owing to a sudden union of the Oxygen.
Take 40 gr of pure Silver. dissolved in ℥j Acid Nitrous c Aq. ℥ij Sp: Vin. ℥j, then gently apply heat precipitates of a white powder, this is not inferior to ye fulminating Silver.
is detonated by Pressure Percussion in Contact with Acid: Sulphuric
Plating performed in a Manner similar to Gilding. The Silver is made into an amalgam with Quicksilver

Take of Black powder which is precipitated by Copper from Solutions of Nitrate of Silver
4 parts Common salt & Sal Am: part: 16
Hyd: Arg: ℥j rubbed together & made into a Paste with Water rub the surface of Copper with Aq: fort: and apply it
Another Method of Silvering
℞ of the same Bk Powder as above ℥xv Sod: Mur: ℥ij Cream of Tart: ℥ij.

P. L.) Yields a *Metallic Precipitate* to many of the other *Metals,* as also to *Phosphorus,* burning *Charcoal,* burning *Sulphur,* &c.—and an *Oxyd* of silver to the *Fixed Alkalies* and *Earths.*—With *Ammonia* forms a triple compound still more remarkable for its fulminating property than that of *Gold* (*Argentum Fulminans.*) Manner of preparing this—and causes of failure.

Silver also soluble in Nitro-Sulphuric Acid (*Aqua Regina* of *Keir.*)

And in the common *Sulphuric Acid* by the assistance of a boiling heat.

Although slightly or not at all acted on by the other *Acids,* many combine readily with its *Oxyd*; hence the decomposition of *Nitrate of Silver* by *Muriatic* or *Oxy-muriatic Acid,* and their compounds, and the consequent formation of Muriate of Silver (*Luna Cornea.*) This remarkable for its easy *Fusibility, Insolubility* in water, and becoming *dark coloured* on exposure to *Light,* which produces a change of colour, equally striking, in *Chromate of Silver.*

Silver, in its *metallic state,* not combinable either with *Alkalies* or *Earths,* or with any of their saline compounds.

In the state of *Oxyd* it communicates a *yellowish olive* or *brown* colour to glass.

Unites in various proportions with most of the other *Metals,* and with all the other *combustible Bodies, Carbon, Azote* and *Hydrogen* excepted.—Loses its *Ductility* by combination with *Tin,* and with Copper, its usual alloy, becomes *harder* and more *sonorous.*—Forms a *dark violet coloured* mass with *Sulphur.*—With *Phosphorus* becomes more *fusible* and *brittle.*

Order of attraction in the moist way, *Muriatic, Sebacic, Oxalic, Sulphuric, Saccho-lactic, Phosphoric, Nitric, Arsenic, Fluoric, Tartareous, Citric, Formic, Lactic, Acetous, Succinic, Prussic,* and *Carbonic Acids, Ammonia*; in the dry way, *Lead, Copper, Quicksilver, Bismuth, Tin, Gold, Antimony, Iron, Manganese, Zinc, Arsenic, Nickel, Platina, Sulphuret* of *Potash, Sulphur.*

Used in the construction of various *Utensils;* in the composition of *Bell-metal*; in *Silvering, Enamelling, Soldering, Dying, Medicine,* &c.

Of Quicksilver.

Found chiefly either in a *Native State;* or alloyed with silver, *Native Amalgam;* or in union with muriatic and sulphuric acids, *Horn*

Black Powder 15 grains ʒj Soda Muria
j Potass Sulp, ʒſs c Alum made into a
paste and spread over the metallic
surface you want to Silver, but the
most substantial mode of Silvering
consists in sprinkling over the plate
of j Borax, & lay on this a piece of laminated Silver & they are bound together ~~that~~ applied
Nitrate of Silver afford a very delicate test
for Muriatic Acid ——— as also for Arsenic

used as an indelible Ink and by some
to Darken ye Hair also commonly used
as a Caustic by Surgeons in this Country

Part of Nitre with Acid Sulph. Pt 10 this compd
readily dissolves Silver
Silver can combine with Sulphur and also
with most of the Metals.
With Copper in certain proportions forms the
Silver coins of this Country -

... Iron filings

Quicksilver

Sometimes found in Combination with other Metals

When pure it has a brilliant bright Surface this fluid opaque perfectly reflects images Sp: Gr: 13

When exposed 39 below Zero or 71 Deg: below the freezing point it congeals, this experiment may be made by mixing Snow & Muriate of Lime

Mr Walker however has shewn that it may be Congealed without Snow or ice by y^e Simple action of cooling Mixtures

It may be congealed by y^e evaporation of Sulphure of Carbon or Æther a Substance which is remarkably evaporable Dr Marcet has Surrounded with this liquor, Filled with Quicksilver & Wrapt it in Lints Wetted with y^e fluid & placed it in (exhausted receiver) Dr Marcet applied the Surface as well which the frozen Quicksilver was Contained, and applied it to his tongue when it produced a film of ice and found difficulty in detaching it. This is y^e Drs explanation of this phenomenon.

Congealed Mercury undergoes much Contraction directly opposite in that respect to Water 1/23rd part of the whole bulk. it increases in Size Cavendish exp^d this

Congealing Mercury gives an appearance of Chrystallization.

Mercury boils at a Temper: of 650 or 660. Its Vapor is invisible like air Condenses again by Cold: Its Vapor is expanded like Water by the operation of Caloric

Change of Color Quicksilver undergoes when exposed to air is owing to impurities being mix'd with it When by Distillation this change does not take place. Agitation produces a Change of its makes it of a dark Color mostly thought Oxygen was Absorbed during this Agitation Mercury found that it was an Oxyde but Dr Marcins to Say there is doubt about it. This is not thought the Case of Burzerius. The reason why Its not and that Oxygen is absorbed is because the Mercury is more from pulverations & spontaneously. Mercury rubbed with Mucilages Chalk or fats are thought to be oxydes as Empl: Hyd: Ung: Hyd: Pil Hyd.

Mercury is exposed to a boiling Heat in a vessels () the Quicksilver gradually loses Its Metallic form its is converted into the Hyd: Oxyd: rubrum Contains 8 parts in 100 of Oxygen by ~~Chenevix~~ Considered to be so If the Heat increased the Oxygen is expelled again & the Quicksilver is reduced again.

Mercury acted upon more less by Acids particularly by Acid Sulphic with which forms a Super Sulphate of Mercury

the excess of Acid is driven off by Heat it becomes Neutral Salt in this State it is Soluble in water. If Hot Water be added to the Neutral Sulphate of Mercury it becomes yellow & a Subsulphate of Mercury is formed

owing to the Water attracting some of the acid from the Salt. This yellow powder was called Turpeth Mineral. Now Hyd: Sub flavus of Edinbro'.

Acid: Nitric: act powerfully on Mercury. If Strong the action is rapid. a White Chrystalle is obtain Hyd: Nitrat. This is readily decomposed by Ammonia by its Stronger affinity for Nitric Acid.

Mercury; or mineralised by sulphur, *Native Cinnabar*.

Manner of obtaining it from its ores, and of ascertaining its purity. Freed most effectually from foreign admixture by cautious distillation.

When pure, of a *silver white* colour, *brilliant*, *fluid* at a common temperature, specific gravity 13.568.

Congeals at 39 below 0 *Farenh.* and then found to be malleable.

In its liquid form attracts moisture on exposure to the atmosphere, loses its splendor and contracts a grey pellicle. By agitation with access of air or trituration with mucilage or other tenaceous substances, is converted into a *greyish* or *black Oxyd*: hence the more common preparations of quicksilver, viz. *Pilul. Hydrarg.* P. L. *Unguent. Hydrarg.* P. L. *Emplast. Hydrarg.* P. L. &c.

Passes from its liquid state into that of vapour in vacuo even at a common temperature; but under atmospherical pressure, requires to be heated to 600 *Farenh.*

If continued under exposure to air at this temperature, is converted into a sparkling *red Oxyd*, containing a larger proportion of *Oxygen*

than that obtained by trituration, (*Hydrarg. oxyd. rubrum* P. L.) Of the chemical properties of this oxyd.—When exposed to a red heat in close vessels it is decomposed, yielding pure *Oxygen Gas,* and the original *Metal.*

Quicksilver acts either directly or indirectly on all the *Acids.*

Partially decomposes and combines with the *Sulphuric Acid* by the assistance of heat. Produees with it a white ponderous saline mass, which on the affusion of boiling water assumes a *lemon yellow* colour, (*Hydrarg. Vitriolat.* of the old Pharmac.) The change of colour thought to depend upon the abstraction of a portion of the undecomposed acid.

Dissolves in the *Nitric Acid* more or less readily, and with a more or less copious evolution of *Nitrous Gas,* according to the temperature and strength or dilution of the acid, *Nitrate of Quicksilver.*—This exposed to a low red heat, by a further and more complete decomposition of the acid, yields a red *Oxyd,* (*Hydrarg. Nitrico-oxyd.* P. L.) Analogous in all its properties to the *Hydrarg. Calcinat.* or common *Oxyd.*

Has no action on the common *muriatic acid,* unless previously oxydated; but with the *Oxygenised Acid* combines with great facility and

, the Acid: is disengaged the
or very different from the Hyd: Oxyd: rubrum
ing not acted upon by Acid: Muriat: unless in
State of Oxyde —;

d: Oxymur: soluble in 20 times its weight of cold
ter: it is very soluble in Alcohol

(H) $\boxed{\text{M}}$ — Hyd Oxymu

Liq Hyd Oxymu: Made by ℥viij Hyd
℥i of Solution the Spirit promotes the solution

Hyd: Oxymu: detected by vinz means one of the best as viz: Dip a piece of Gold into a fluid Containing Hyd: Oxymu: Take a piece of Zinc Wire & bring it into Contact with Gold: the Zinc

Muriate of Tin in solution by added a precipitate will appear & a Change of Color in brownish Color —

When the Hyd: Oxymuri: is taken in large quantities it produces Infl: of Small intestines a Very ... down with sometimes ... Salivation very quick Dose 1/10 of a grain to 1/2.
Hyd: Oxy: as viz:. Purified Quick. 2 parts. Sulph: Ac & Muriate of Soda —

..e quantity of Hyd: Oxyd: with carefully rubbed
with its weight of Quicksilver the whole is
made of a greyish color. If this is Heated &
sublimed a white powder is produced
which is Calomel. This is Sublimed 2 or 3
times before its pure. If Lime Water
poured on Calomel by which its deprived
a greater portion of its acid: it is Hyd: Oxyd:
..inum of Mur Ph: thought not to likely to
..ntake of Bowels
..mmonia also deprives it of its Acid & makes
..ark Colored
..lutions of Corrosive Subl: decomposed by
..Alkalies

..uriate of Ammon & Potass: Subcarbon.

..recipitating a Solution of ~~Argent~~ Hyd: Nit: by a
..lution of Soda Muricas, will form
..precipitate analogous to Hyd: Submur:

℞ 100 gr of Merc: in ℥iss of Acid: Nit: by heat dissolved
into Cold Solution pour ℥ij of Alcohol by
Measure & apply heat a fume arises & a
powder falls down. This must be washed with
Cold Water & afterwards dry it in a Water ba

Exploding force of Fulminating Mercury is produ

without effervescence: hence the preparation of *Oxy-Muriate of Quicksilver, (Hydrarg. Oxy-Murias.* P. L.) and of *mild Muriate of Quick-silver, (Hydrarg. sub-Murias* ; and *Hydrarg. oxyd cinereum,* P. L.)

Of the processes employed for obtaining these as well in the moist as in the dry way—new views of these compounds.

Of the combination of *Oxyd* of quicksilver with the *Acetic* and other *Acids.*

The acid solutions of this, like those of other *Metals,* decomposed by *Alkalies* and *Alkaline Sulphurets,* and by most of the *Earths.* The degree of previous *Oxydation* indicated by the colour of the resulting precipitates; those by *Potash* and *Soda* are of a yellow or reddish brown; those by *Ammonia* of a grey or white colour, *(Hydrarg. Præcipit. Alb.* P. L.) *Ammoniacal Muriate of Quicksilver*—Fourcroy.

Zinc, Iron and *Copper* precipitate *Quicksilver* from its solutions in its *metallic* form; a similar effect produced, though slowly, by *Phosphorus.* —*Alcohol,* added to the solution of *Nitrate of Quicksilver,* and assisted by heat, furnishes a precipitate, which when dried and heated, explodes with great violence, *Howard's Fulminating Mercury.*

Quicksilver amalgamates with most other *Metals*; very readily with *Gold, Silver, Lead, Tin, Zinc* and *Bismuth*; less easily with *Platina, Copper,* and *Arsenic,* and difficultly, if at all, with *Iron.*

Combines by different *Modes,* and, as was supposed, under different degrees of *Oxydation* with *Sulphur.* By fusion and subsequent trituration, or by trituration simply, into a ponderous black powder (*Hydrarg. cum Sulph.* of the old Pharmac.) *Œthiop's Mineral;* and by fusion and sublimation into a red striated mass (*Hydrarg. Sulphuret Rubr.* P. L.) *Vermillion. Artificial Cinnabar.* Which may also be prepared by double decomposition, from a mixture of *Muriate of Quicksilver* and *Sulphuret of Antimony, Cinnabar Antimonii.*

Preparations analogous to the former procurable, by agitating *Quicksilver* in solutions of *Alkaline Sulphurets.*

Order of attraction in the moist way, *Sebacic, Muriatic, Oxalic, Succinic, Arsenic, Phosphoric, Saccho-lactic, Tartareous, Citric, Nitric Fluoric, Acetous, Boracic,* and *Carbonic Acid*; in the dry way, *Gold, Silver, Platina, Lead, Tin, Zinc, Bismuth, Copper, Antimony, Arsenic, Iron, Alkaline Sulphurets, Sulphur.*

Gold with Quicksilver is much employed in Gilding

— 1 parts of Sulph: only be mixed with 7 or 8 parts of Quicksilver & Sublimed. Vermilion is produced

Quicksilver is very important in arts &c

Preparat: of Mercury. as viz in Lond: P

Quicksilver in its pure State.

Pil. Hyd Hyd c Cret: Ung: Hyd: in great Division perhaps low Oxydate

Hyd: Oxyd: rubrum

Hyd: Nitrico Oxyd:

Hyd: Oxymurias vel Corrosive Sublimate

Hyd: Submurias vel Calomel

Hyd: Oxyd Cinereum

Hyd: precipit: Album — which is Hyd Oxyd precipitated by Ammonia:

Hyd: Sulph: rubrum or Vermilion

Loses its lustre readily on exposure to *Air*, becoming first of a dull *grey* colour, and afterwards *whitish*.

Melts at 540 *Farenh.* and if cooled slowly crystallizes into quadrangular pyramids. Heated more intensely, it boils and emits fumes; if under exposure to air, it passes readily into a state of *Oxyd*, and assumes different colours, according to the degree of oxydation; hence *Grey Oxyd*, *Massicot*, *Minium* and *Litharge*. These and all the other oxyds of lead easily vitrified, *Glass of Lead*; and this easily decomposed, if heated, with the addition of *Charcoal*.

Lead in its metallic state little affected, either by the *Sulphuric* or *Muriatic Acid*, but dissolves readily in the diluted *Nitric Acid*, and forms with it a crystallizable salt.

Exposed to the vapour of the *Acetous Acid*, is converted into a laminated white oxyd, (*Flake White*, *Ceruse*, or *Plumbi Carbonas* of the last Pharm.), which, dissolved in a further portion of this acid, produces a crystallizable astringent salt, remarkable for its sweetness, (*Sugar of Lead*, *Plumbi Super-acetas*, P. L.) (*Liquor Plumbi Acetatis*, P. L.)

When highly oxydated, as by treatment of its red oxyd by *Nitric* or *Oxy-muriatic Acid*, forms

the Red Oxyd by being heated gives out its
Oxygen & resumes form in Running [illegible]
[illegible] is called Hydrargy

[illegible] Oxygen was obtained with the Red Oxyd
[illegible] the heat this with [illegible] If a
[illegible] is [illegible] of [illegible]
[illegible] of [illegible] may be [illegible]

When the red Oxyde is heated to Redness it gives
its Oxygen & [illegible] easily [illegible] Hydrargy
Hydrarg by exposure to air [illegible] in forming
[illegible] which [illegible]
[illegible] at a [illegible] but the [illegible]
[illegible] not to be [illegible]

[illegible] at any temp.
[illegible] if kept covered with water it becomes
[illegible] with a white [illegible] perhaps by the
[illegible] acting upon it

[illegible] of [illegible]
the heat

[illegible]

[illegible] by [illegible]

[illegible] by Phosphate of Soda

If [illegible] be exposed to boiling [illegible] the [illegible] is formed. it is a Carbonate [illegible]

If [illegible] be [illegible] The Phosphate [illegible] is a Combination of the [illegible] the [illegible]

[illegible]

The dry [illegible] by [illegible] the [illegible] in Water [illegible]

a *brown* precipitate, which inflames without detonation when strongly triturated with *Sulphur*.

Is precipitated from its solutions of a *white* colour by *Alkalies* and by *Earths*, and of a *dark brown* by *Alkaline Sulphurets* and *Sulph. Hydrog. Gas*. Its solutions also decomposed by the *Sulphuric, Muriatic* and *Phosphoric Acids*, and their compounds.

May be oxydated by deflagration with *Nitre*, and by fusion with the *Fixed Alkalies* becomes soluble in water.

Unites by fusion with most of the metals, viz. with *Platina, Gold, Silver, Copper, Tin, Bismuth*, &c. Amalgamates readily with *Quicksilver*, but refuses to combine with *Iron*.

Melts with *Sulphur* into a grey coloured brittle compound, less fusible than itself, *Artificial Galena*; with *Phosphorus* into one which is malleable, but more disposed to tarnish.

The *Oxyds* of *Lead* soluble in *Expressed Oils* and *Animal Fats*: hence the preparation of certain *Plasters, Varnishes* and *Paints*; are capable also of decomposing several of the compounded *Salts (Patent Yellow)*; and remarkably promote the vitrification of earthy bodies and other metallic oxyds, as in *Glass-making*, and in the *Refinement of Gold and Silver*.

Order of attraction in the moist way, *Sulphuric, Sebacic, Saccho-lactic, Oxalic, Arsenic, Tartareous, Phosphoric, Muriatic, Nitric, Fluoric, Citric, Formic, Lactic, Acetous, Boracic, Prussic* and *Carbonic Acid, Potash*; in the dry way, *Gold, Silver, Copper, Quicksilver, Bismuth, Tin, Antimony, Platina, Arsenic, Zinc, Nickel, Iron, Alkaline Sulphurets, Sulphur.*

Employed in *Medicine*, and very extensively in the *Arts*, particularly in the construction of *Buildings*, and different *Utensils*; in the making of *Shot, in Statuary, Glass-making, Glazing, Painting, Varnishing, Refinement of Gold* and *Silver, Composition of Pewter*, and *Plumber's Solder*, &c. &c.

Of Copper.

Found 1*st*. *Native*; 2*d*. combined with oxygen and sometimes with iron, *Tile Ore, Pitch Copper Ore*; 3*d*. with carbonic acid, *Green* and *Azure Copper Ore*; 4*th*. with arsenic acid, *Arseniate of Copper*; 5*th*. with sulphuric acid, *Sulphate of Copper*; 6*th*. with muriatic acid, *Muriate of Copper*; 7*th*. with sulphur, *Vitreous Copper Ore*; 8*th*. with sulphur and iron, *Yellow*

The Sponges with lead Cement [illegible] produced
by Carrying Damp Oxygen.

The Detection of Lead is very easy
-tained by some Preparation of Sulphur
whether the fluid be perfectly neutral or
not acid,

Copper

-as known in most ancient times

-e ores of Copper are very common

-e Carbonate of Copper is also Called Malachite

-pper sometimes is in Solution in Some of the
-pper Mines

-ound in Wales in a kind of Fern which
-ntains a quantity of Copper, it was discovered
-t the Shoes of horses that feed on that fern being
-ted with Copper

Combined with Arsenic forming Arseniate
Copper

When Copper is heated in contact with the air, it becomes covered [illegible] by a further heat [illegible] [illegible] formed.

Copper readily combines with the Acids

By adding Ammonia to a Solution of Copper a blue-ish precipitate is formed

In order to combine Copper with Sulph. Acid, heat is required to form the Copper Sulphate or S^t [illegible] Sulphate commonly chiefly applied [illegible]

Copper Ore; 9*th*. with arsenic and iron, *White Copper Ore*; and 10*th*. with lead, antimony, iron, sulphur, alumine, silex and silver, *Grey Copper Ore*.

Manner of *extracting* it from its ores, and of *purifying* it.

Colour, bright brownish red—*taste,* nauseous styptic—*odour,* when rubbed disagreeable—*hardness,* somewhat greater than that of *Gold* or *Silver*—*Malleability, Ductility* and *Tenacity* considerable—*Sp. Gr.* if soft 7.788, if compressed nearly 9—when hard, *elastic* and *sonorous*.

On exposure to *Air* loses its lustre and contracts a greenish rust: in the *open Fire* is converted into a dull brownish red or black *Oxyd,* which heated to redness with *Filings* of *Copper,* assumes an orange colour.

Fuses at 27° *Wedw.*=4587 *Farenh.* and if heated more intensely is *volatilized* in fumes.—In cooling slowly *crystallizes* into quadrilateral pyramids.

Is more or less acted on by all the *Acids.*

Dissolves with the assistance of a boiling heat in concentrated *Sulphuric Acid,* and affords transparent oblong rhomboidal crystals of a deep *blue* colour, *Sulphate of Copper, Blue* or *Roman Vitriol* (*Cuprum Vitriolatum* P. L.)

Dissolves in diluted *Nitric Acid* with effervescence and the production of *Nitrous Gas,* forming a deep *blue* solution, and by evaporation a deliquescent salt, which detonates on being suddenly heated *(Nitrate of Copper.)* The precipitate obtained from this solution by adding *Chalk,* forms a beautiful but fugitive pigment, *Blue-verditer.*

Is in its metallic state slowly acted on by the *Muriatic Acid,* unless assisted by heat; the solution, of a *grass green* colour, on evaporation yields *cubical* crystals, whilst a solution of the orange coloured oxyd before mentioned, yields colourless *octahedrons,* which are not affected by *Ammonia,* unless after exposure to air.

Moistened with the *Acetous Acid,* under exposure to air, corrodes into a *green* saline *oxyd, Verdegris of Commerce (Ærugo* P. L.), which by additional acid dissolves, and yields a beautiful *dark green* transparent salt, *Distilled Verdegris:* both employed as pigments.

Easily attacked by the *Sebacic Acid* of rancid oil or fat, especially if before in any degree *oxydated.*

Most of the saline preparations of *Copper,* particularly the *Nitrate* and *Muriate,* soluble in *Alcohol,* which then burns with a *green* flame.

Nitrate of Copper has the property of deflagrating
acting violently on some of the Metals
when some of the Powdered salts is
wrapped up in a piece of Tinfoil. The ten-
dency [illegible] Dispersed be [illegible] by [illegible]

[illegible] Ammonia [illegible] [illegible] by
[illegible]

[illegible] Copper is long exposed to the [illegible]
[illegible] Verdigris is formed.

Mixture of Anhydrous Sulphate of Copper
Parts Beng^l Red 5 Parts [illegible]
[illegible] 2 Parts When then thrown on
[illegible] burns with a beautiful flame

of 3 Ounces of Copper [illegible]

[illegible] Gold is an alloy of 1 Ounce of Copper to 12 of Gold

[illegible]

Is more or less acted on by all the *Alkalies.* With *Ammonia* forms a beautiful *blue* solution, which disappears on the exclusion and returns on the admission of *Air.* *Ammonia* the most delicate test of the presence of *Copper,* with the exception mentioned above.

Is precipitated of a fine *grass green* colour from its solution in *Sulphuric Acid,* by *Arseniate of Potash, Scheele's Green Pigment.* Of a *blue* colour from the *Nitric Acid* by *Chalk,* as before mentioned, and in a *metallic* state from all its solutions by *Zinc* and *Iron, Zement Copper.*

Detonates with melted *Nitre,* and by the assistance of heat decomposes *Muriate of Ammonia.*

Unites by fusion with many of the other *Metals,* forming very important compounds, as with *Platina* into one of great density and hardness; with *Gold, Standard Gold*; with *Silver, Standard Silver* and *Silver Solder*; with *Tin, Bronze* and *Bell-metal*; with *Arsenic, Tombac*; with *Zinc, Brass* and *Manheim Gold,* and with *Antimony* a violet coloured alloy.

Combines also with *Sulphur* and *Phosphorus* by fusion. Is tarnished by immersion in *hepatized Water.*

The *Oxyds* of *Copper*, impart a *greenish* tinge to *Glass*.

Order of attraction in the moist way, *Oxalic, Tartareous, Muriatic, Sulphuric, Saccho-lactic, Nitric, Sebacic, Arsenic, Phosphoric, Succinic, Fluoric, Citric, Formic, Lactic, Acetous, Boracic, Prussic* and *Carbonic Acids, Potash, Soda, Ammonia, Uuctuous Oils*; in the dry way, *Gold, Silver, Arsenic, Iron, Manganese, Zinc, Antimony, Platina, Tin, Lead, Nickel, Bismuth, Cobalt, Quicksilver, Alkaline Sulphurets, Sulphur, Phosphorus*.

Use very extensive, being employed in the construction of *Buildings* and *Coppering of Ships*; in the formation of various *Culinary* or other *Utensils*, in *Bell* and *Cannon Founding*, in *Coinage*, in *Enamelling, Dying, Painting*, and *Medicine*.

Of Iron.

Of all metals the most frequently and abundantly met with, and generally in the following forms; 1st. *Native*.—Circumstances always attending the presence of *Native Iron*—*Native*

Iron

the [illegible] of Magnetism, by being rubbed

[illegible] of the [illegible]

Iron is found native but [illegible] found

[illegible]

Hermand.

It is to the Researches of our english Chemists, that we are indebted for the knowledge of the fundamental [illegible] of this metal.

The magnet of iron [illegible] [illegible]

The [illegible] black [illegible] which is composed of Nickel

[illegible] plates [illegible] connected together by [illegible] [illegible] of [illegible] Nickel

...ne Bones which fell have been found both with degrees of
...tem merely vitrified

...n 1000 at Weston in North America a Meteor was
...n by several persons, a correct account of which the
...dlin Newspaper the whole being copied from it
...blished in the 2d Vol. of Philosophical Magazine

...y generally may always fall obliquely which i...
...at they are projected with some considerable force
...me Some Planet

...t is Supposed by Some that they proceed from Some Planet
...hich in Passing too near the Earth have dropped of them
...t this is merely hypothetical (this is Mr Howard's Opinion)

...the Iron is found in greatest abundance in State of Oxyde
...ommon Haematite Red Oxyde of Iron or Haematite is
...count of its being red
...cular Iron in Chrystals found Comb'd with Sulphur
...om Isle of Elba.
...cular Iron a Species of Haematite
...y Iron is an Oxyde of Iron
... Oxyde of Iron found Sweden which is Magnetic
...ystallized Iron Ore or Compound of Iron
...on Carbonic Acid & Manganese
...gillaceous Oxyde of Iron
...rite Iron is Sulphuret of Iron which is very
...mon

To obtain Iron from the Ore it is necessary [illegible] the Heat
[illegible] to expel the sulphur [illegible]
[illegible] the Ore with a [illegible] with Charcoal [illegible]
[illegible] of Iron is [illegible] with it

The use of the Charcoal is [illegible]
The [illegible] the Iron [illegible] absorbing the
sulphur [illegible] the [illegible]
Pig Iron, Cast Iron & Bundle Iron, [illegible]
[illegible] Terms.

Cast Iron more fusible than Pig Iron

In order to convert Cast Iron into Bar
it [illegible] & kept in a State of fusion [illegible]
[illegible] Iron of the Cast Iron
[illegible] forging [illegible] Bar Iron
Forged Iron in proportion to its purity it is
more Ductile & Malleable

Iron proved to be of *Meteoric Origin.*—Description and chemical history of *Meteoric Stones.*—Origin of these stones discussed; 2*nd.* in state of grey oxyd, *Grey Iron Ore*; 3*rd.* united with carbonic acid, *Hæmatite*; 4*th.* with carbonic acid, alumine, and often phosphoric acid, *Argillaceous Iron Ore*; 5*th.* with carbonate of lime and oxyd of manganese, *Spathose Iron Ore*; 6*th.* with sulphuric acid, *Native Sulphate of Iron*; 7*th.* with chromic acid, alumine and silex, *Native Chromate of Iron*; 8*th.* with sulphur, with arsenic; or with both, *Iron Pyrites, Mispickel, Arsenical Pyrites.*

As obtained from its ores by the usual process of reduction, forms a fusible mass, of a blueish grey colour and coarse granular fracture, very hard and brittle. *Crude* or *Cast Iron,* which freed from its impurities by continued exposure to a strong heat and subsequent hammering and rolling, loses its brittleness, becomes of a lamellar or fibrous texture, and capable, when red hot, of having several portions welded by compression into a continuous mass, *Bar* or *forged Iron.*

This, by cementation or fusion with *charcoal,* acquires weight, becomes again fusible, brittle when cold, of a close granular texture, suscep-

tible of a high polish, very elastic and capable of taking on a great degree of hardness if heated and suddenly cooled, *Common* and *Cast Steel.* Operation of *Tempering.*

Bar Iron the purest. Colour of this *blueish grey,* when polished very *splendid*—has a slightly subacid taste, and when rubbed a sensible *odour* —*harder* than most other metals—more *tenacious* than any—considerably more *ductile* than *malleable*; Sp. Gr. from 7.6000 to 8.166.

Iron distinguished by its being attracted by the *Magnet.*

Susceptible of different degrees of *Oxydation. Black* and *Red Oxyd.* Is speedily converted into a yellowish or reddish brown rust on exposure to air and moisture, (*Rubigo Ferri* of the former Pharm.), and still more speedily into a dark grey oxyd, by combustion in *Oxygen Gas,* digestion in warm *Water,* or the application of its vapour to it under ignition.

Dissolves more or less readily in all the *Acids.* Its solution generally accompanied with the evolution of *Hydrogen Gas,* and the resulting compounds possessing different properties according to its degree of *Oxydation.*

Requires the aid of heat to decompose *Concentrated Sulphuric Acid,* but dissolves readily in

[illegible] Carburet of Iron

Steel is [illegible] by [illegible] [illegible] of Iron
[illegible]

[illegible]
[illegible]
[illegible] Iron [illegible] [illegible] in [illegible]
[illegible]

Plunging red hot Steel in Cold Water it increases
hardness very much.

Temper Steel you make it red hot then dipped in
[illegible] & taken out. The degree of hardness is judged of
the Color that appears if the blue Color hardness
[illegible] as that of Springs of Watches &c.

One of the most remarkable properties of Iron is the Magnetism
[illegible] this applies principally to Pure Iron

Iron is very difficult of fusion but if in contact
with Carbon it fuses quickly [illegible] [illegible] [illegible]
[illegible] softens extremely Malleable [illegible]
[illegible] property of Welding

[illegible] Burns in Oxygen Gas [illegible] [illegible]
[illegible] black Oxyde of Iron [illegible]
[illegible] exposure to air [illegible] [illegible] Oxygen
[illegible] the red Oxyde of Iron

Oxyde may be Obtained [illegible]
[illegible] [illegible]
[illegible] the black Oxyde [illegible]

[illegible] Sulphur [illegible] when exposed to air [illegible]
[illegible] [illegible] of [illegible] [illegible]
[illegible] a [illegible] of Carbon

but when Iron Rust by sulphuration of iron without an Pure Oxyde is formed.

The action of Sulphuric Acid on Iron evolves Hydrogen

Precipitates spontaneously in the form of ochre from most of its acid solutions on exposure to *Air*. When thrown down from these by an *Alkali*, may be re-dissolved by the addition of a further portion of it, *Alkaline martial Tincture of Stahl.*

Combines with the *Fixed Alkalies* by fusion.

Deflagrates with *Nitrate of Potash*; and sublimes with *Muriate of Ammonia*, which it partially decomposes (*Ferrum Ammoniatum* P. L.)

When in the state of *Oxyd*, promotes the fusion of several of the *Earths*, and communicates different tinges to *Glass*, according to the degree of *Oxydation*.

Unites by fusion with all the other metals, except *Quicksilver*, *Lead*, and *Bismuth*. In combination with *Arsenic*, becomes brittle when heated, (*Red-short Iron.*)

Has of all metals the strongest attraction for *Sulphur*, with which, when heated, it unites very readily into a dark grey, brittle, and remarkably hard compound, *Artificial Pyrites.*

Is also capable of entering into combination with phosphorus, (*Cold-short Iron*), and with charcoal, *Steel* and *Plumbago.*

Order of attraction in the moist way, *Oxalic Acid, Tartareous, Sulphuric, Saccho-lactic Muri-*

verted into a *grey oxyd (Putty ;)* by a continuance of the heat is changed into a perfectly *white Oxyd,* extremely difficult of fusion or reduction, *Basis of White Enamel:* a similar *Oxyd* obtained by exposing it when in fusion to the vapour of *Water.*

Broken when nearly or just congealed, exhibits an irregular columnar *Structure,* and by agitation while passing from the fluid to the solid state, may be reduced into very small grains (*Pulvis Stanni* P. L.)

Does not dissolve in the *Sulphuric Acid,* but by the assistance of heat decomposes it and becomes *oxydated.*

Rapidly decomposes the *Nitric Acid,* with a copious evolution of *Nitrous Gas,* and is converted into a *white Oxyd:* but in the considerably diluted acid, unaided by heat, dissolves and forms *Nitrate of Tin,* which burns with a thick white flame, and detonates with a heated crucible.

Dissolves readily in the *Muriatic Acid;* the solution yielding needle-form crystals which attract moisture.

Dissolves with still greater readiness in the *Oxy-muriatic Acid,* and in the *Nitro-muriatic Acid,* or *Aqua Regia,* yielding solutions remarkable for their property of forming a brilliant

and permanent scarlet precipitate with infusion of *Cochineal* and other analogous substances, (*Carmine*, and *Scarlet-dye*.) When united with *Oxy-muriatic Acid* in the *dry way*, by distillation with *Muriate of Quicksilver*, a volatile colourless liquor is obtained, which, on exposure to the air, emits copious dense white fumes, *Smoking Liquor of Libavius*.

Is slowly corroded by the continued application of the *Acetous Acid* in the form of vapour; and by long digestion, this acid dissolves a small proportion of it.

The solutions of *Caustic Fixed Alkalies*, assisted by heat, exert a solvent power both on *Tin* and its *Oxyds*, but most on the latter: *Caustic Ammonia* affects only the *Oxyds*.

Is little affected in the *dry way*, either by *Alkalies* or *Earths*, but decomposes the compounds of the former with the *Sulphuric Acid*. Detonates rapidly with *Nitre*, and decomposes *Muriate of Ammonia*.

Decomposes moistened *Nitrate of Copper* with an impetuosity productive of actual combustion.

May be united more or less readily with all the other *Metals*, and in various proportions; occasioning in most of them an alteration in their *Malleability*, *Fusibility*, *Specific Gravity* and *Hard-*

ness: with *Copper*, according to the proportions, forms *Gun-Metal, Bronze, Bell-Metal, Speculum-Metal*; with a small proportion of *Iron* becomes harder and more sonorous; with half its weight of *Bismuth* forms *Tutenag*; with an equal weight of *Lead, Soft Solder*. When free from *Arsenic* does not, in small quantity, much impair the malleability of *Gold*.

Melted with *Sulphur*, produces a dark grey, striated, brittle compound; which, if prepared by sublimation, is of a light spongy texture and composed of golden coloured scales, used to imitate bronze, *Sulphuretted Oxyd of Tin, Aurum Musivum*; which may also be prepared by heating gradually equal parts of Sulphur and the *White Oxyd*.

May also be combined with *Phosphorus*.

Order of attraction in the moist way, *Sebacic, Tartareous, Muriatic, Sulphuric, Oxalic, Arsenic, Phosphoric, Nitric, Succinic, Fluoric, Saccholactic, Citric, Formic, Lactic, Acetic, Boracic, Prussic, Potash, Ammonia*; in the dry way, *Zinc, Quicksilver, Copper, Antimony, Gold, Silver, Lead, Iron, Manganese, Nickel, Arsenic, Platina, Bismuth, Cobalt, Alkaline Sulphurets, Sulphur, Phosphorus*.

Employed in the composition of *Solder, Pewter, Bell* and *Gun-Metal, Printer's Types*, &c. in the silvering of *Mirrors*, construction of *Electrical Instruments*; in *Tinning, Enamelling, Dying, Medicine*, &c.

Of Bismuth.

Found 1*st.* *Native*; 2*d.* in union with Oxygen, *Native Oxyd*; 3*d.* with Sulphur, *Sulphuret of Bismuth.*

Manner of procuring it from its *Ores.*

Colour, *yellowish white.*—Specific gravity 9.822.—Texture *foliated*—not very *brittle.*

But little subject to tarnish. Melts at 460 *Farenh.* and in cooling crystallizes into cubes.

If kept in fusion with access of *Air* is converted at first into a blueish and afterwards into a brown *Oxyd.*—Heated to redness burns, with a small blue flame, and emits a yellowish smoke, condensible into an *Oxyd* of a similar colour, (*Flowers of Bismuth,*) which by increase of heat melts into a greenish *Glass*, analogous to glass of *Lead.*

Dissolves most readily in the *Nitric Acid,* and furnishes a salt, which detonates readily when exposed to sudden *Heat*; and which may be decomposed by the affusion of *Water,* yielding a white *Oxyd, (Magistery of Bismuth).* The other acids dissolve its oxyds, but do not act upon the metal.

Its precipitate by *Sulphuret of Ammonia* of a similar appearance to that which this produces in solutions of *Lead.*

Deflagrates both with *Nitre* and with *Oxymuriate of Potash,* and is converted into an *Oxyd,* which, like those already mentioned, facilitates the fusion of the *Earthy Bodies,* and also of the other *Metallic Oxyds.*

Combines with most of the other *metallic Substances,* rendering *Platina, Gold,* and *Silver* more brittle, and the metals in general more fusible.

Precipitates *Platina, Gold, Silver,* and *Quicksilver* from their acid solutions, but is itself precipitated by *Lead.*

Has very little affinity to *Phosphorus.*

Unites easily with *Sulphur* into a blueish-grey striated compound, which resembles the native *Sulphuret,* and may be decomposed by *Silver* and *Lead.*

Its *Oxyds*, like those of *Lead*, dissolve in *Unctuous Oils* by the assistance of heat.

Order of attraction in the moist way, *Oxalic Acid*, *Arsenic*, *Tartareous*, *Phosphoric*, *Sulphuric*, *Sebacic*, *Muriatic*, *Nitric*, *Fluoric*, *Saccho-lactic*, *Succinic*, *Citric*, *Formic*, *Lactic*, *Acetous*, *Prussic*, *Carbonic*, *Ammonia*; in the dry way, *Lead*, *Silver*, *Gold*, *Quicksilver*, *Antimony*, *Tin*, *Copper*, *Platina*, *Nickel*, *Iron*, *Zinc*, *Alkaline Sulphurets*, *Sulphur*.

Used in the composition of *Pewter*, *Solder*, and *Printer's Types*, in *Painting*, *Imitation of Silvering*, and occasionally in place of *Lead* in the refinement of *Gold* and *Silver*, and in *Assaying*. The *white Oxyd of Bismuth*, likely to prove an useful medicine.

Of Nickel.

Found 1*st*. alloyed with Iron, *Native Nickel*; 2*d*. combined with Oxygen, *Native Oxyd*; 3*d*. with Iron, Arsenic, Cobalt and Copper, *Kupfer Nickel*.

Extremely difficult to obtain it free from iron: accordingly varies somewhat in colour,

being occasionally *reddish, yellowish* or *greyish white.*—Specific gravity also varies from 7.88 to 9.333.—Texture *minutely granulated.*—*Hard* yet somewhat *malleable.* Is likewise *magnetic.*

Requires nearly the same heat as iron to fuse it; is very fixed in the fire, and difficult of oxydation by heat.

Deflagrated with *Nitre* yields a *greenish Oxyd*, which communicates a hyacinthine tinge to *Glass.*

All its solutions of a *green* colour: that in the *Nitric Acid* (in which it dissolves most readily) affords green rhombic crystals. Precipitated from its solutions by lime water and by the alkalies; Ammonia re-dissolves it, and produces a *blue* solution.

Forms brittle compounds with *Gold, Copper, Iron* and *Tin*; all the *Meteoric Stones* contain *Nickel* united with *Iron*; refuses to combine either with *Silver* or *Quicksilver*, and unites readily by fusion both with *Sulphur* and *Phosphorus.*

Order of attraction in the moist way, *Oxalic, Muriatic, Sulphuric, Tartareous, Nitric, Sebacic, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Acetous, Arsenic, Boracic, Prussic, and Carbonic Acids, Ammonia*; in the

Arsenic

It is an Oxyde of Arsenic which we know under this nam[e]
Arsenical Pyrites obt^d from Sometimes the
In nature it is found in its Metallic State, then commonly
alloyed with Iron.

When Comb^d with Sulphur forms what is named Orpiment
Realgar. Sometimes these are mixt^d the last is red & 1^st yellow
[i]f this is treated with Blowpipe it emits a Sulphur: smell.

Arseniate of Lime Sometimes found but its a rare product
Pure arsenic brittle. Sp: G: 5·7
passes into a State of Vapor without previous fusion & if
the process be performed without excess of air it Condense[s]
[a]t upper part of y^e Vessel. Dr Marcet performs this in a
Glass Tube which is well cleaned: this Succeeded well.
White oxyde has an acrid taste & is Corrosive. & Soluble con-
[sider]ably in Water. This Burning in Oxymuriatic Acid Ga[s]
[i]t reddens the Inf: of Litmus & Comb: with y^e Alkalies
Flowers of Arsenic.

Arsenious Acid is obt^d by evaporation

dry way, *Iron, Cobalt, Arsenic, Copper, Gold Tin, Antimony, Platina, Bismuth, Lead, Silver, Zinc, Alkaline Sulphurets, Sulphur, Phosphorus.*

This Metal not yet applied to any use.

Of Arsenic.

Found 1*st.* alloyed by Iron, *Native Arsenic;* 2*d.* combined with Oxygen, *Native Oxyd;* 3*d.* with different proportions of Sulphur, *Realgar, Orpiment;* and 4*th.* with Sulphur, Iron, and sometimes Silver, *Mispickel.*

Colour, *steel-grey*—texture, *scaly*—very *brittle,* but not *hard.*—Specific gravity 5.763 to 831.—Much disposed to *tarnish.*

Volatile in close vessels at 356 of *Farenh.* and in condensing crystallizes in tetrahedrons.

If exposed to *Air* under the heat of ignition, burns with a blue flame, and is converted into a white *Oxyd, Common white Arsenic, Flowers of Arsenic, Arsenious Acid.*

This said to be soluble in about 80 times its weight of cold and 15 times its weight of boiling water. Taste *caustic.*—Less volatile than the *Regulus.*—Emits a garlic smell on the application of *Heat.*—*Vitrescible.*—Promotes the fusion

of *Earthy Bodies.* When melted with *Sulphur,* produces different shades of colour, according to the proportions and the degree of *Heat* or state of *oxydation*; hence artificial *Orpiment* and *Realgar.*—By treatment with the *Nitric Acid,* becomes more completely *oxygenated, Arsenic Acid.*—Decomposes *Nitre* in the dry way, producing a neutral crystallizable salt, *Arsenical Salt of Macquer.*—If distilled with unctuous matter, reassumes the form of *Regulus.*

In its *metallic* state, decomposes most of the mineral acids; the *nitric* most readily: if powdered and thrown into *Oxy-muriatic Acid Gas,* burns with a *white flame.*

Unites with most of the other *Metals*; rendering brittle those which are ductile, and in a remarkable manner increasing the fusibility of some, and diminishing that of others: thrown into *Oxy-muriatic Acid Gas,* burns with a *blue* flame.

To the red and yellowish metals communicates a silvery whiteness.

Soluble in *Alkaline Sulphurets.* Soluble also in *Uuctuous Oils,* with which it forms a consistent mixture.

Combines readily with *Phosphorus.*

Most of the preparations of this metal in a high degree *noxious*; the detection of their pre-

By a very strong heat y^e acid is Decomposed & again becomes a white Oxyde

When melted with Sulphur in diff^t proportions forms orpiment & Realgar.

Arsenical Salts are obtained as viz:

Deflagrating Nitre with y^e White Oxyde of Arsenic forms Arseniate of Arsenic.

Sulphate of Copper mix^t with ~~Ar~~ Arseniate of Potash makes a fine Green color Scheele's Green

Arsenic capable of for^g alloys with most Metals destroys their ductility & increases their fusibility.

Alloy of Arsenic & Platina is very fusible indeed

Arsenic used in many of the arts

In y^e Manufactory of Glass it employed also used in dying.

Symptoms of Poison from Arsenic by Black

in a 1/4 of Hour Sickness & Distress Th: & Heat in Bowels involunt: Salivation a Bloody Fl.d from Mouth excess: pain & Vomits Syncope. Cramps extreme weakness & D— .. Desp: Intest: Infl: & sometimes erosions of Ar[illegible] before Death. always the intestines But be guarded in saying erosions of Stomach are from arsenic as that takes place from y^e action of Gastric juice.

Dr Marcet says it is merely infl: of Mucous Coat of the ~~Sto~~ Intest & no infl: of Peritoneal Covering, frequent ulcerations in Mucous Membrane of Intestine

Treatment. Plentiful Drinks of Mucilage as Decoct Ho[rdei] Ol: Ricini are the most efficacious steps to be taken. Water impregnated with Sulph: Hydrogen may be usefully employed. if this can't be born give Hep Sulph: in Pills but better in Solution.

Test: different ways proposed by Dr Marcet. Take y^e Suspected Subs: & put them into a Vessel, the heaviest portions subside. Separate this & mix it with a little Charcoal & Oil put it in a glass Tube & expose it to heat. then if it be present it will Chrystallize at y^e upper part of the Vessel. a very small quantity may be in this way detected. it produces a Metallic ring on the Tube

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a Small quantity of the Metal may be mix'd with a little Charcoal & Oil & placed bet. 2 plates of Copper & Red heat applied if arse[nic] be present a White film will be produced

Arsenious Acid is the most active poison
Blk Oxyd: of Arsenic a deadly poison
Pure Metallic Arsenic is ineffectual if alloyed
with another Metal if it is not it becomes
oxydated & therefore poisonous
in Solution much less Dangerous than when
taken in Substance. Sulphuretted Hydrogen comb^d
with water is a good Antidote as Sulphuret
Arsenic is formed wh^t is not very poisonous

... the plate of Copper: If very thin plates of Copper
are employed a Spirit lamp will succeed but
... Marsh employed the furnace.
... have not always a sufficiency of Matter to
obtain these results. Then the[illegible] mode is
preferable. Act upon it in a State of Solution
... Most delicate test in this Way is [illegible] Nitrate
Silver. The Silver Comb: with the Arsenic
forming a yellow precipitate a Little Alkali
Ammonia is necessary. a Very small
quantity indeed may in this Way be detected
... large quantity of Ammonia ... added
disappears.. as the precipitate is Soluble in
Solution of ammonia. Objections to this
there is a Muriatic Salts we shall have a
white precipitate disguising the yellow one
Muriate of Silver is produced! Phosphoric Acid
... Producing the same yellow precipitate with
Nitrate of Silver This has been thought an Objection
certainly is one. as its not impossible for
Phosphoric Acid to be present in ... but this
objection may be ... aside ... the following

Take the precipitate of Arsenic formed by Argent: Nitrat: & Mix it with Charcoal & apply heat a Metallic film will be found on the Tube by this Means Dr M: believes 1/10th of a gr. can be made apparent.

Sulphate of Copper forming Scheele's Green is also a Test in the humid Way. if the solution of Sulphate of Copper is at all Acid, it requires the addition of a little Ammonia.

Medically. Employed in Intermittent Fever. in the Shape of the Tasteless Ague Drops now employed in many disorders. The Dose is from 1/12 to 1/ of a Gr of the Oxyde dissolved in a Solution of Potash forming Arseniate of Potash

Liq: Arsenical gutt: iv contain 1/10th part a Grain This medicine is very useful in Intermittents Dr M deems partial to objected to an account of its occasioning Infl: Diathesis. When it Disagrees causes pain in Head Nausea Tremor Dropsical Swellings & Stop the Med: as soon as these symptoms appear

Cobalt

Combined with Arsenic it is the grey Cobalt Ore

sence therefore often of great moment. Various *tests of Arsenic. Water* impregnated with *sulphuretted hydrogen,* and solutions of *Alkaline Sulphurets,* recommended as antidotes. *Emetics, purgatives,* and copious dilution, the most effectual of these.

Order of attraction in the moist way, *Muriatic Acid, Oxalic, Sulphuric, Nitric, Sebacic, Tartareous, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Arsenic, Acetous,* and *Prussic, Ammonia, Unctuous Oils, Water* : in the dry way, *Nickel, Cobalt, Copper, Iron, Silver, Tin, Lead, Gold, Platina, Zinc, Antimony, Alkaline Sulphurets, Sulphur, Phosphorus.*

Used principally in *Glass-making, Painting,* and *Medicine.* (*Arsenici Oxydum præpartum ; Liquor Arsenicalis,* P. L.)

Of Cobalt.

Found 1*st.* alloyed with Arsenic, *Grey Cobalt Ore* ; 2*d.* united to Oxygen, *Native Oxyd* ; 3*d.* to Arsenic Acid, *Cobalt Bloom* ; 4*th,* to Sulphur, *Sulphuret of Cobalt* ; and 5*th.* to Arsenic, Iron, and Sulphur, *White Cobalt Ore.*

Colour, *light grey*. Specific gravity, from 7.7 to 8.53.—*Compact, brittle*; *hardness that of Tin*.

When very pure, malleable in a red heat.—Fuses at 130 *Wedgw.* and in cooling crystallizes in regular prisms.—Undergoes no change either on exposure to *Air* or *Water* at a common temperature; but, when heated in contact with air, yields at first a brownish oxyd, *Zaffre*, which on further exposure becomes blue, and on fusion with Silex, produces a blue glass, *Smalt, Powder-blue*.

Dissolves with more or less facility in several acids; most easily in the *Nitric Acid*.

With the *Muriatic and Oxy-muriatic Acids* forms compounds, the reddish solutions of which, as often as exposed to heat, change to a beautiful green, *Sympathetic Ink*.

Detonates feebly with *Nitre*.

Unites by fusion with most of the other *Metals*.

Combines difficultly if at all with *Sulphur*; more readily with *Alkaline Sulphurets*.

With *Phosphorus* forms a compound more fusible than itself.

Its *Oxyd* soluble in *Ammonia*.

Native Oxyde of Cobalt

t gives a blue Color to any fusible
ubstance

Not applied to any use except in a State
Oxyde, therefore generally brought
to that State

obalt in its pure State is of a grey color

hen hot slightly malleable. like Iron
ttracted by the Magnet.

haracters written with a Solution of
obalt, are invisible when Cold, but
e plainly seen when heat is applied
t loses its Color again when it cools
Dr Marcet thinks its owing to the Moisture
ing driven off by the application of heat
hat when dry it shews the Color —
ts use is to give a blue Color to vitreous
ubstances. When you suspect a Substance
be Cobalt take a small piece of Glass
Borax and the suspicious substance
nd if it is Cobalt it will tinge the Glass
Borax Blue. which would at once afford
a proof of the existence of Cobalt — a very
mall quantity will by this experiment be
een

Zince

The Discovery indebted to the Athenians

Calamine an Oxyde of Zinc

Blend a Sulphuret of Zinc, but not a pure Sulphuret.

Blend is often found in many parts of the World but especially here

Calamine is the Metal from which the Zinc is always obtained.

The Surface is harsh to the touch

Specific Gravity 7 and 2/10ths

Not Malleable (but little) or Ductile when cold but at a certain temperature is more so but at a high temperature it is rendered again brittle and can be powdered: forming granulated Zinc

Order of attraction in the moist way, *Oxalic Acid, Muriatic, Sulphuric, Tartareous, Nitric, Sebacic, Phosphoric, Fluoric, Saccho-lactic, Succinic, Citric, Formic, Lactic, Acetous, Arsenic, Boracic, Prussic, Carbonic, Ammonia*; in the dry way, *Iron, Nickel, Arsenic, Copper, Gold, Platina, Tin, Antimony, Zinc, Alkaline Sulphurets, Sulphur? Phosphorus.*

Used to colour *Glass*, in *Glazing, Enamelling, Painting, Washing*, &c.

Of Zinc.

Found 1*st.* combined with Oxygen, and frequently mixed with Oxyd of Iron, Silex and Alumine, *Calamine*; 2*d.* with Sulphur, Oxygen and other substances, *Sulphuret of Zinc*, or *Blend*; 3*d.* with Sulphuric Acid, *Sulphate of Zinc*; 4*th.* with Carbonic Acid, &c. *Carbonate of Zinc?*

Colour *blueish white*. Specific Gravity 7.190

Scarcely *malleable*, but can be rendered so by a particular process of *annealing*.

When heated is easily pulverised; and like iron is capable of Decomposing *Water*. Melts at about 700 of *Farenh.* Very easily *volatilized.*

In contact with air, burns soon after ignition, with a brilliant flame, and furnishes a white flocculent *Oxyd* (*Zinci Oxydum* P. L.) convertible by an increase of heat into a yellowish *Glass.*

Is readily acted on by Acids. During its solution in the *Sulphuric* and *Muriatic Acids, Hydrogen Gas* is evolved. Produces with the former Acid, a styptic crystallizable salt, (*Zinci Sulphas* P. L.) is also acted on by *Alkaline* solutions, and by *Water* previously impregnated with *Carbonic Acid Gas.*

May be precipitated from its solutions by *Earths* and *Alkalies.*

Decomposes, in the dry way, *Sulphate of Potash* and many other compounded salts. Detonates violently with *Nitre.* By simple trituration decomposes *Muriate of Ammonia.* Is also capable of precipitating *Alum* in the moist way.

Unites with all the other metallic substances except *Bismuth* ; giving to *Copper* additional elasticity, durability and hardness.

In its *metallic form* cannot be combined with *Sulphur* ; but when *oxydated* unites readily with it.

Order of attraction in the moist way, *Oxalic Acid, Sulphuric, Muriatic, Saccho-lactic, Nitric,*

When Melted in Contact with y Atmos-
then its covers itself with a gray powder

During its combustion the flow of Zinc
is formed.

an intense heat this Oxyde is Vitrified
and if Charcoal is present its reduced

Zinc has scarcely any action on
water when Cold but when heated
like Iron it decomposes it.

It is Soluble in y^e Acids, when Sulphuric
Acid is poured on Zinc, Hydrogen Gas is evolved
which will burn, and when the flame
is very small, it will produce a beautiful
sound if it be covered by a hollow
tube.

Zinc detonates violently with Nitre

Zinc will combine with most of y^e
metals

With Gold it changes its color to a
white and destroys its ductility

In a State of Sulphate it is used in Medicine

Zinc.

Calamine is an Oxyde of Zinc often comb^d with other Substances

When Comb^d with Sulph: forms Blend or Sulp: of Zinc

The Color of Calamine gener: brown not a Pure Sulph: Cont^s generally Iron Lead arsenic &c

Blend & Calamine f^d in many parts of y^e World.

Zinc is generally obt^d from Calamine it is powdered & exposed to Heat with Charcoal. The Metallic Matter Condenses in y^e Top of y^e Vessel.

Zinc of a bluish White Color.

Sp: G. 7 2/10^ths Melts 700 of Farenh: Ref Heat be push'd in Closed Vessels it volatilizes without Change

If Zinc is Heated it is Malable & Ductile. in high heat may be broken with facility.

The Flexibility by temperature in Zinc suggested that utensils sh^d be made of it but this is now abandoned

When Zinc is Melted in air it Oxydates.

During y^e Combustion of Zinc y^e Zinc Oxyd: is formed which rises

Zinc has a power of decomposing Water when Heated to redness -

Dilute Sulph: Acid acts upon Zinc powerfully & forms the Zinci Sulph: of Lond: Ph:

The Nitrate & Muriatic Acids act upon Zinc readily with the last Hyd: Gas is formed?

Zinc violently deflagrates with Nitre.

Zinc in a State of Oxyde combines with Sulphur

Zinc forms amalgams with the Metals with Gold it unites readily destroying its Ductility

With Copper it forms Brass - it is made by exposing Calamine Charcoal & Copper to Heat & in this way it is readily formed

If a Mixture of Zinc in a granulated State - mixt with Water be thrown into a red hot Crucible it burns Splendidly

Zinc is used in the Construction of the Galvanic Pile

Antimony.

a rare prod: in Nat. State.

Other Metals occasionally found with it

Native Ant: of a yellowish White Color. when heat with ye Blow pipe gives out a peculiar Smell

The Sulphuret of Ant: ye most Abundant. Varieties of it 'Red Antimonial Ore 2 in a Mass of Quartz chrystalls of Red Antimony

Pure Antimony is obtd by Melting ye Sulpht of Ant & This when Separated is Called Crude Antimony This purifyed by Heating it with Nitre.

Pure Ant: is of a bluish White Color part when recently broken it is Destitute of Ductility Moderately Hard but yields to a Knife.

Sebacic, Tartareous, Phosphoric, Citric, Succinic, Fluoric, Arsenic, Formic, Lactic, Acetous, Boracic, Prussic, and Carbonic, Ammonia; in the dry way, *Copper, Antimony, Tin, Quicksilver, Silver, Gold, Cobalt, Arsenic, Platina, Bismuth, Lead, Nickel, Iron.*

Uses—in *Alloys,* particularly with *Copper* and *Tin*; externally and internally in *Medicine.*—A powerful agent in evolving *Galvanism.*

Of Antimony.

Found 1*st. Native*; 2*d.* alloyed with Arsenic, *Native Arsenical Antimony*; 3*d.* in union with Oxygen, *Native Oxyd*; 4*th.* with Muriatic Acid, *Muriate of Antimony*; 5*th,* with Arsenic Acid and Sulphur, *Red Antimonial Ore*; 6*th.* with Sulphur only, *Grey Antimonial Ore*; and 7*th.* with Iron, Arsenic, Sulphur, and sometimes Silver, *Plumose Antimonial Ore.*

Manner of extracting it from its ores, and the different processes for obtaining its *Regulus.*

Colour, *silvery-white.* Hardness, equal to Zinc. Texture, *laminated. Very brittle.* Sp. Gr. from 6.702 to 6.860. Simply loses its lustre

on exposure to the *Air*; and is not altered by *Water* unless exposed to it when red hot.

Melts soon after ignition; on cooling *crystallizes* into octohedrons; is *volatile* in close vessels. When heated in contact with *Air* is converted into a light *white Oxyd*, (formerly called *Argentine Flowers of Antimony*) which are soluble in water, and fusible into an *Hyacinthine Glass*; in close vessels by parting with different portions of oxygen, they acquire a *brown, orange*, or *yellow* colour.

Decomposes both with *Sulphuric* and *Nitric Acids*, the former with, the latter without, the assistance of heat. Requires long digestion for its solutions in the *Muriatic Acid*; but in the *Oxy-muriatic* dissolves with great facility.

Precipitable from the latter by Zinc or Iron, in the form of a *black Oxyd*, which when dried by a gentle heat *takes fire* spontaneously in the air, and is converted into *white Oxyd*.

Decomposes, in the dry way, most of the saline *Compounds* of the *Sulphuric Acid*. Detonates readily with *Nitre*; and decomposes *Muriate of Quicksilver*.

Combines with most other *Metals*, and renders them *brittle*. Said more than any other metal to diminish the *Magnetic* property of *Iron*.

[Th]is Metal Suffers but little from Heat & Moisture but
[i]n a White Heat it Oxydates & forms ye Argentine
[F]lowers of Antimony. Contains by Davy 1/5 Cent
[o]f Oxygen.

[The] Ant: dissolved by Most Acids

[The] Muriatic Acid acts Slowly on Antimony but
acts powerfully on it when its Oxydated forming
[A]nt: Murias. or Butter of Antimony. Made from
[B]rown Oxyde of Ant: & Common Salt with Sulph: Acid
[A] Similar Comp^d may be formed by the Connection
[of] Oxymuriatic Acid with Antimony. it is highly
[c]austic when Concentrated. If the Butter of Ant:
[is] exposed to air it absorbs Moisture & becomes
[l]iquid.

Ant: Tart: of Lond: Ph: Sulph: ant: 2 Nitre,
Cream of Tart: 2 Acid. Sulph: 2 parts
The Acid mixed with 1½ of Water & Gently Heated.

Chemical Aff: in Ant: Tart:
The Sulp: Acid decomp: ye Nitre the Nitrous Acid set at liberty Oxyd: ye Ant: the excess of Acid then comb: with Oxyd: of Ant: & forms Sulph: of Ant: which is decomposed by ye Water alone. by this process we have formed an Oxyd: of Antimony wch is capable of uniting with ye Tartaric Acid which ye Supertartrate of Potash Contains

Preparation now in use –

Ant: Oxydum which is a Peroxyde –
Ant: Sulphur: Praecipit:
Pulv: Antimonial: Sulphuret of Ant: heated with Hart's horn shavings
Ant: Tart:

Ant: Tart: Liquor 2 gr in 1/2 ounce.

equal parts of Sulphuret of Antimony & Nitre deflag.
forms the Crocus of Antimony.

Calcined Ant: obtained from 1 part of the Sulph. to three of
Nitre. therefore very similar to the Above Crocus of
Antimony

The Crocus having been employed for the diff.t
Antimonial preparations but now is in a
great measure expelled.

Unites with *Sulphur* in all proportions, and forms with it a *grey striated* compound, *Antimony* of the shops.

This, when exposed for a continuance to a low heat, yields a *Grey Oxyd*, which by fusion is converted into a *yellowish Glass* (*Vitrum Antimonii* of the former Pharmac.;) this levigated and mixed with melted wax forms the *Vitrum Antimonii Ceratum* of the late P.E.

Roasted with *Hartshorn* and afterwards ignited, yields a *white Powder* (*Pulvis Antimonialis* of the late P.L.—*Oxydum Antimonii cum Phosphate calcis* P.E.)—When deflagrated with *Nitre*, is more or less decomposed according to the degree of combustion (*Antimonium Calcinatum*—*Antimonium Ustum cum Nitro*—*Crocus Antimonii* of the former P. L. and P. E,)

Reduced to powder and boiled in a solution of *Potash*, deposits, on cooling, an *orange* coloured precipitate (*Kermes Mineralis* Ph.Suec.); and on the addition of the Sulphuric Acid to the solution whilst hot, a *brownish red* precipitate, (*Antimonii Sulphuretum præcipitatum* P. L.) These *Hydro-sulphurated Oxyds of Antimony.*

A mixture of *Sulphuret of Antimony* and *Muriate of Quicksilver*, or of *Crocus of Antimony* and *common Salt*, with the addition of *Sulphuric Acid*,

produces, by distillation, a butyraceous compound, (*Antimonium Muriatum* of the late P.L.), which appears to be an *Oxy-muriate of Antimony*, and which on the affusion of common water, or by the addition of Potash, furnishes a *white Oxyd*, or rather *Sub-oxy-muriate*, (*Powder of Algaroth.*) The combination of this with acidulous Tartrite of Potash, forms a triple salt (*Antimonium Tartarisatum* of the old P.E.)

A similar preparation obtained from *Glass* or *Crocus of Antimony* (*Antimonium Tartarisatum*), which, like the former, is soluble in different kinds of Wine (*Vinum Antimonii tartarisatum* of the old Pharm.)

The preparations retained in the present Pharm. of London are *Antimonii Oxydum*, *Antimonii Sulphuretum præcipitatum*, *Antimonium tartarisatum*, *Liquor Antimonii tartarisati*. Nature of these preparations.

Order of attraction in the moist way, *Sebacic Acid*, *Muriatic*, *Oxalic*, *Sulphuric*, *Nitric*, *Tartareous*, *Saccho-lactic*, *Phosphoric*, *Citric*, *Succinic*, *Fluoric*, *Arsenic*, *Formic*, *Lactic*, *Acetous*, *Boracic*, *Prussic* and *Carbonic*; in the dry way, *Iron*, *Copper*, *Tin*, *Lead*, *Nickel*, *Silver*, *Bismuth*, *Zinc*, *Gold*, *Platina*, *Quicksilver*, *Arsenic*, *Cobalt*, *Alkaline Sulphurets*, *Sulphur*.

The Muriate of Antimony used to be used as a Caustic but it is now expelled from the Practice

Davy found the Muriate of Antimony Contains no muriatic Acid but is a Compound of Oxymuriatic Acid or Chlorine and Antimony

If filings of Ant:y be dropped into a Phial containing Oxymuriatic Gas it will burn and Muriate of Antimony will be formed.

When Muriate of Ant:y is Concentrated by evaporation, it becomes a powerful Caustic.

Both obtained by the action of Nitre on Antimony simply by deflagration

The Crocus is made by mixing.–
equal part of

The Ant: Calcinat: is part.

These three Oxydes were formerly used as $\frac{e}{y}$ bases of the different preparation of Ant^y but now there is a new Oxyde introd by $\frac{e}{y}$ London College, which is Considered Superior

Emetic Tart: a triple Combination of Antimony Pot & Tart. Acid

The most important preparation of Antimony is the Combination with $\frac{e}{y}$ Acid of Tartar, Made by boiling the Supertartrate of Potash — with red brown Oxyde of Antimony — The Operation very simple proportions, Oxy Chrys of Tart. Oxy Water Oxd. 1 filtered, Chrystals & and Chrystallize it is the Antimon: Tartarizati

The Jas's Powder, appears to Phosphoric Acid, antimony and Lime a Combination of these three Things

1 Part of Sulphuret of Ant^y and 2 parts of horn Shaving Calcined together in broad Pot:

Printing Types are Made by $\frac{e}{y}$ alloy of Ant: & Lead

If Sulphuret of Ant^y be boiled in a solution of Potash Dest^d Water allowing it to cool it forms a Kermes Mineralis of old Pharmacopea.

Oxydes of Ant^y are in some degree soluble in wine it requires a tedious digestion and after all the strength of different preparations will be by no means regular

Ant^y forms alloys with other metals, but the only useful one

King's or Naples Yellow is oxyde of Antimony and oxyde of Lead. This (antimony) is greatly used in the practice of Medicine as a Sudorific The Antimonial powd: is the one most commonly used, and certainly one of the best forms of it;

Ant: Calcinat is a peroxyde and all the oxyde which is obtained.
consequently inert comparatively with this oxyde. Antimony is a gentle purgative.

Manganese

Its a Metal which as a very strong action for Oxygen, that its only found in a State of Oxyde

There are 2 different kinds of it.

1 in which it is Combined with Oxygen &

the other in which its Combined with Carbonic Acid

The Native Oxyde found pract ? in England

The Carbonate doubted whither found in England

The Purification of Mangan: is difficult on account of its infusibility & its great attract for Oxygen it Consists in exposing it to Heats Continued with Carb

The Siliceous Manganese shewn combin with Quartz

Manganese neither Ductile or Malleable –

it is soluble in Nitric Sulphuric & Muriat: Acid: which Solution may be decomposed by y^e Alkalies & a White Precip:

The action of Acid: Nit: on its forms Nitrous G

but the diluted Sulph: acid. Muriat: Acid form Hydrogen Gas because the Water decomposed.

Used in the composition of *Printer's Types,* and of *Nails for Coppering Ships,* in *Medicine,* &c.

Of Manganese.

Found 1*st. Native*; 2*d,* in union with Oxygen, *Native Oxyd*; and 3*d.* with Oxygen, Silex, Iron, and Alumine, *Siliceous Manganese.*—Said also to be contained in the ashes of most *Vegetables.*

Colour *dull* or *greyish white.* Texture, *granular.* Sp. Gr. from 6.850 to 7. Hardness next to *Iron. Very brittle.*

Next to Platina difficult to fuse; but *oxydates* more easily than any other metal: its *Oxyd* of different colours, *white, red* and *black.*

Soluble in the diluted *Sulphuric,* in the *Nitric, Muriatic* and several other acids.

In the state of *Oxyd,* occasions in the *Muriatic Acid* a striking change of properties, by imparting to it a portion of its *Oxygen.*

Its action on the *Alkalies* not yet ascertained.

When oxydated, decomposes both *Nitrate of Potash* and *Muriate of Ammonia,* in the dry way.

In this state unites by fusion with the *Earthy Bodies*, and when added to *Glass*, either renders it *colourless* or communicates a *violet* tinge, according to the degree of *Oxydation*.

Unites also, by fusion, with *Sulphur*, into a *yellowish-green* mass. By mixture with unctuous substances, sometimes occasions *Inflammation*.

Combines in the metallic state with most of the other *Metals*, rendering *Gold* and *Iron* more fusible, *Copper* less.

Order of attraction in the moist way, *Oxalic Acid*, *Citric*, *Phosphoric*, *Tartareous*, *Fluoric*, *Muriatic*, *Sulphuric*, *Nitric*, *Saccho-lactic*, *Succinic*, *Sebacic*, *Arsenic*, *Formic*, *Lactic*, *Acetous*, *Prussic*, and *Carbonic*; in the dry way, *Copper*, *Iron*, *Gold*, *Silver*, *Tin*, *Alkaline Sulphurets*.

Employed principally in *Glass-making* and *Bleaching*.

Of Tungsten, or *Wolfram*.

Found 1*st*. in an *acid* form in combination with Lime, *Tungstate of Lime*; and 2*d*. with Oxyd of Manganese and of Iron, Silex, and Tin, *Wolfram*.

Colour *steel grey*. Texture *granular*. *Extremely hard*. Sp. Gr. 17.6.

of Sulphuric Acid: is applied to Black Manganese and heat applied Oxygen Gas is evolved

In the Nitric Acid the Oxyde of Mang is not dissolved unless a portion of Sugar then be added

The fixt Alkalis exert an action on Black Oxyde of Mang: they combine with it and form a Compound, Soluble in water, and these Solutions will be different colors by adding diff^t proportions of Water or diff^t Temperatures Distilled Water and Pump Water used the pump Water will act more rapidly — Distilled Water is it very imperfectly, Mineral Camelion take of Black Oxyde[1] and Dried[2] Soda or Potash equal parts, expose its to heat (red)
The Same Compound formed by deflagrating Nitre with Black Oxyde of Manganese in a Crucible red Hot

The Oxyde of Manganese is used in the Manufactoring of Glass — as it is able to destroy the green color which the Iron is apt to cause

The Oxymuriatic Gas for Bleaching is Made from
the Black Oxyde of Manganese.

Nearly *infusible,* requiring a heat at least equal to 170° *Wedg.*

Yields a yellow *Oxyd, (Acid of Tungsten,)* which in close vessels becomes *blue* or *black.*

Insoluble in the *Sulphuric, Nitric,* and *Muriatic Acids.* Slightly soluble in the *Oxy-muriatic.*

Combines with the other *Metals.* Does not lessen the ductility of *Silver* or *Copper*; but renders *Iron, Tin, Bismuth, Antimony,* and *Manganese* harder.

Order of attraction in the moist way, *Lime, Potash, Ammonia*; in the dry way, *Potash, Lime, Iron, Manganese.*

Not as yet applied to any use.

Of Uranium.

Found 1*st.* in combination with Sulphur, *Pechblende*; 2*d.* with *Oxygen,* (on the surface of the former,) *Yellow Oxyd*; and 3*d.* with Carbonic Acid and a little Copper, *Calcolite.*

Has been but imperfectly reduced.

Appears capable of uniting with several of the *Acids.*

Its *Oxyds* tinge glass of various colours, *brown, grey,* and *green.*

Of Molybdena.

Found in combination with Sulphur. *Molybdena,* formerly confounded with *Plumbago.*

Hitherto obtained only in *agglutinated grains.*

Colour, externally *whitish yellow,* internally *grey.* Sp. Gr. 7.5. *Brittle.*

Less fusible than either *Platina* or *Manganese.*

According to the experiments of *Mr. Hatchett,* is capable of combining with four different portions of *Oxygen,* producing a *black,* a *blue,* a *green Oxyd, (Molybdous Acid,)* and a *yellow* or *white (Molybdic Acid.)*

When combined with *Iron, Copper* and *Silver,* renders them friable.

In union with *Sulphur* regenerates *Sulphuret of Molybdena.*

Order of attraction unknown.

Not yet applied to any use.

Of Titanium.

Found combined with *Oxygen* in the *Red Schorl* of *Hungary*; and in *Manachanite.*

Of a colour somewhat resembling *Copper*. Appears to be *infusible*, but capable of being *volatilized*.

Difficultly *oxydated* by any of the acids.

With *Iron* forms a compound of a gold colour internally.

Of Tellurium.

Found in several of the *Ores of Gold*; and in considerable proportion.

Of a *whitish-leaden* colour; *metallic lustre*; *laminated* texture; *very brittle*; Sp. Gr. 6.115.

Of all metallic substances the *most fusible* except *Quicksilver*, like which it may be *sublimed* in brilliant globules.

Burns with a *blueish-green* flame. Soluble in the *Nitric*, *Muriatic*, and *Sulphuric Acids*; from which it may be precipitated by *Alkaline Sulphurets* in the form of a powder, in appearance much resembling *Kermes Mineral*.

Said to be the only metal, except *Gold*, *Platina* and *Antimony*, which is not precipitated from its solutions by *Prussian Alkali*.

Its *Oxyds* so rapidly reduced on heated *Charcoal* as to occasion actual *detonation*.

Of Chrome.

Found 1*st.* in an *Acid* form combined with Oxyd of Lead, *Red Lead of Siberia*; and in a similar acid form in the *pale red Ruby*; 2*d.* with Oxygen, in the *green Emerald of Peru*; 3*d.* in the *Meteoric Stones.*

May be obtained in a *concrete acid* state, and of a red colour, from the two first, by treatment with *Carbonate* of *Potash*; or in the form of a *green Oxyd* from the last by treatment with *Muriatic Acid.*

Has as yet been but imperfectly reduced.

Of a *greyish white* colour; *very hard*; *very brittle*; and *very difficult* of *fusion.*

Not soluble in the *Muriatic* or *Sulphuric Acids*; and difficultly in the *Nitric* and *Oxy-muriatic.*

Combined, in its *Acid* state with *Muriatic Acid,* is capable of dissolving *Gold.*

Of Columbium.

Discovered some years ago in an *Acid state* by *Mr. Hatchett,* in a dark grey mineral, sent with

some iron ore from *America,* and which appears to consist of more than three-fourths of this acid combined with iron. Its colour in this state is *white;* it *reddens* litmus paper; is insoluble in boiling *Nitric Acid,* but soluble in *Sulphuric Acid* when strongly heated, and also, when recently separated from Potash, in boiling *Muriatic Acid.*

It gives colourless solutions with *Acids* and *Alkalies*; is precipitated from its acid solutions by Alkalies in *white flocculi,* by Prussiate of Potash of an *olive green colour,* and by Tincture of Galls of a *deep orange.*

Is extremely difficult of reduction.

The supposed new metal called *Tantalium,* discovered by *Mr. Ekeberg* in the mineral called *Tantalite,* shewn by *Dr. Wollaston* to be identical with *Columbium.*

Of Cerium.

Lately discovered in a *copper mine* in Sweden. May be obtained in the state of *white* or *red Oxyd.* Both these oxyds soluble in *Sulphuric*

Acid. The white oxyd most soluble in the *Nitric*, and the red oxyd most soluble in the *Muriatic Acid.* The *salts of Cerium* have a *Saccharine* taste. Can hardly be said to have been obtained in the reguline state. Appears to be volatile at high temperatures.

ORGANISED BODIES.

Form two classes, *Vegetable* and *Animal,* consisting nearly of the same constituent principles or elements, but in different proportions.

The chemical affinities of the constituent principles of both, influenced by the *living principles.*

Carbon, Hydrogen and *Oxygen,* the *ultimate* constituent parts of *Vegetables,* as furnished by *Analysis. Air* and *Water* the principal sources of these. They also contain *Saline, Earthy* and *Metallic* matter, the latter in small quantity.

Manures, How they promote vegetation.

Circumstances in which *Vegetable* snbstances differ from *Animal.*

The Supply of Carbon is derived from the Atmosp

The agency of Light is necessary for the welfare of
vegetation

...earthy Substances are used as Man-
ure in different ways. Some merely mech-
anical. Lime for Instance is useful
hastening the process of Putrefaction
If it be the Carbonate of Lime this is useful
on account of the Carbonic Acid Gas it
yields —

Vegetable Substances

These are formed naturally without any decomposition

Cork the bark of the Quercus Suber growing in the South of Europe like wood in its chemical features a light Spongy Substance, inflammable affords a little Ammonia by distillation it affords when acted on by y Nitric Acid it yields the Suberic Acid.

Lignin may be considered as bases of all other vegetables. naturally often possesses of Taste and Color. the necessity to some essential Acid.

The strong Acids act powerfully on it the Acid. Sulphuric: which completely chars it. Carbon is the Principal of it

The astringent quality of Substances were thought to exist on y existence of Gallic Acid

Tan contained in large quantities in Gall nuts also in Cort. Quercii; and the inspissated juice of y Mimosa Catechu. if you macerate the oak bark in Water the Tan and Gallic Acid are dissolved by the Water

if you Put into this Solution a little jelly a flaculent precipitate takes place which is a Compound of Gelatin & Tan and the Gallic Acid set at Liberty

Vegetable Substances.

Their *proximate* parts, or immediate productions are, *Cork, Woody-fibre, Tan, Colouring Matter, Extract, Oils, Resins, Wax* and *Tallow, Camphor, Gum, Jelly, Gluten, Albumen, Caoutchouc, Starch, Sugar, Native Salts* and *Earth.*

Several of these already spoken of.

Cork,—the exterior part of the *Quercus Suber,* a substance *sui generis.* Yields *Suberic Acid* by treatment with the *Nitric Acid.*

Woody-fibre,—that which is left after the digestion of ligneous matter in *Water* and *Alcohol.*

Tan,—contained in all astringent vegetable substances, but most plentifully in *Catechu* and the *Gall Nut,* from the concentrated infusions of which it may be precipitated by *Carbonate of Potash* or by *Acids.* When dry is of a brown colour, brittle, of a very astringent taste, very soluble in *Water,* and still more so in *Alcohol.*—Forms an insoluble compound with *Glue,* and produces a deep blue precipitate when added to the solution of *Oxy-sulphate of Iron.* On distillation yields an *Acid Liquor,* a small proportion of *Empyreumatic Oil* and about *one-thirty-eighth* its quantity of *Charcoal.*

Colouring Matter,—that part of *Vegetable Substances* which is attracted by the fibres of *Silk, Linen, Wool,* &c. in the act of dying.—*Mordants*; their nature and use explained. Differs in its other properties according to the subject from which it is obtained.

Extract,—obtained from the watery infusion of *Saffron,* and many other plants, by evaporating it to dryness. Distinguishable from all other vegetable substances by being soluble both in *Water* and in *Alcohol,* but not in *Sulphuric Æther.*

Gum,—procured most plentifully from certain species of *Mimosa.* When pure, colourless, insipid, soluble in *Water* but not in *Alcohol* or *Oils.*—Not prone to decomposition by keeping.—Soluble in the *Vegetable Acids* without alteration, but decomposed by the *Mineral.* 100 parts said to consist of 65.38 *Oxygen,* 23.08 *Carbon,* and 11.54 *Hydrogen.*—An article of the *Materia Medica*; useful also in divers manufactures, particularly in *Calico Printing.*

Jelly,—obtained from the expressed juice of *Currants,* and many other fruits, in the form of *Coagulum,* by allowing the juice to remain for some time at rest, decanting off the thinner part, and washing the remainder in a small

an Infusion of Galls will form the Same
result

Tannin may be obtained by precipitating a Solution of by Lime Water the precipitate is Tannin mixed with Lime which last may be got rid of by Acid: Muriatic:

Tannin Soluble in Water also slightly in Alcohol

The most characteristic character of it is its property of combining with Gelatine thus the formation of Leather

This effect on Leather ascribed to an astringent power exerted on the Leather or contractility. Mr Seguin first took this view of the Subject. The Tanning of Leather consists in effecting a Combination of Tannin and Gelatine. The Common Way is to keep the Skin immersed in a Solution of the Bark for a long time.

The operation of Tannin may be very much accelerated by putting the Leather into a very strong Tannin rather than of oak Bark. but Leather prepared in this Way is not found good, its only the outer part of it that is affected. In Tanning morocco Leather, they only tan one side by the Sumach: The Russia Leather is tanned by a very peculiar means, the Color is given it by Lignum Campechium: & Alum Abl—

Coloring Matter - Certain kinds of Linen

x of Wood Madder. the the Coloring matter is given out to an Aqueous fluid, the Coloring matter thus formed has an affinity to attach itself to Linen.

But the Coloring Matter has a much greater attraction for certain Mineral Substances therefore a Common practice, to impregnate the Cloth to be Dyed with some of these before the Color is applied. These are Called Mord[ants]
When a Mordant is used you can't wash the Color out which of Course is an advantage

Indigo a Beautiful blue Dye

It is not Soluble in Water but is in dilute Sulphuric Acid: which is used as a D[ye] and which acts at the same time a[s] a Mordant

The Vegetable Colors Called Lakes.

Carmine thus is also prepared by the same process, from Cochineal.

Extracts.. distinguished from all other vegetable Substances in being Soluble in Water

its general properties and when Pure are Soluble in Water and Alcohol affinity particular) for the Oxygen

Gum is Contained in many Plants but particularly in the Mimosa exudes sometimes from the Bark sometimes parent globules insip[id] soluble in Water either Cold or hot Spirit separates gum from a Solution it. Gum differs from sugar only in containing only a smaller portion Oxygen

Vegetable Jelly. somewhat resembles Animal Gelatin in its tremulous motion..

Gluten, contained bountifully in Wheat

When dried it is semitransparent resem-
Glue, it is on account of the Gluten
that it is so conveniently used in making
bread.

Albumin

Coagulable by heat, also in Acids

quantity of water.—In this state is nearly colourless, and of a tremulous consistence.—Soluble in hot water, but again coagulated in cooling.—When dried becomes transparent.—Combines readily with *Alkalies,* and by the *Nitric Acid* is converted into *Oxalic.*

Gluten,—the grey coloured tenacious and insipid substance which is left behind in washing the paste of *Wheaten Flour* in repeated portions of *Water.* In its *moist* state much disposed to putrify.—When dried resembles *Glue.*—In boiling water loses its tenacity. Soluble in all the acids, and in solutions of the *Alkalies* by the assistance of heat.—Insoluble in *Water, Alcohol, Æthers* and *Oils.*—Differs from most other *Vegetable* substances, and resembles *Animal* in containing *Azote.*

Albumen,—so called from its resemblance to white of egg.—Obtained by exposing to a boiling heat, the water employed in the preparation of *Starch* from flour, or the depurated expressed juice of *Scurvy-grass, Cresses, Cabbages,* and most other cruciform plants.—Separates at this temperature in the form of *Coagulated Flakes.*—Is also precipitated from its water solutions by *Alcohol* and *Acids.*—When dried resembles *Glue,* and is

then readily soluble in *Alkalies.*—In distillation yields *Carbonate of Ammonia,* and consequently contains *Azote.*

Caoutchouc,—the inspissated milky juice of certain trees, the *Hævea Caoutchouc, Iatropha Elastica,* and others growing chiefly in *South America.* When fresh is of an ash colour; without taste or smell.—Very elastic.—Sp. Gr. 0.933.—Not altered by *Air.*—Perfectly insoluble in *Water.*—Soluble in *rectified Petroleum.*—*Volatile Oils,* and in pure *Æther,* but not in *Alcohol.*—Is decomposed by the assistance of heat both by the *Sulphuric* and *Nitric Acids,* but not affected by *Alkalies.*—Melts readily when heated, yields *Ammonia* in distillation, and in the open fire burns with a white flame.

Starch,—the grey or white sediment deposited by *Wheaten Flour, Potatoes,* and various other vegetable substances, after diffusion in water.—Has scarcely any smell, and but little taste; though insoluble in *cold Water,* combines with it by *boiling* into a kind of *Mucilage.*—Altogether insoluble in *Alcohol,* and not readily acted on by *diluted Acids ;* but soluble without decomposition by *Alkalies,* unless when they are concentrated and assisted by heat. By destructive distillation yields a large proportion of

Is a Concrete Vegetable juice

The juice is received into a Vessel pro-
wounds made into the tree that produce
and moulds of Clay in form of a little
bottle, the Mould is dipped into the Juice which
adheres to it. The Natives make Shoes
by the same process .. very elastic .. and a
the property of its when Cut is for
the Cut edges to adhere firmly its is very
useful in Chemical experiments

Starch applied to a Substance existing in
Vegetables like Gum . procured by the
process for the Separation of Gluten, .
Totally insoluble in Cold water but readily
Converted into a Jelly by Boiling —
Sago Saloop & Indian. Island. Potatoe
in Wheat

It is considered the result of Saccharine fermentation

it abounds in great abundance in many vegetables but the Sugar Cane is the only thing which is planted for its selection obtained by pressure - and in the impure state its undergoes a Process for purifying it and forms the loaf Sugar. Blood contained a large portion of Saccharine Matter

Mr Howard as lately invented a new Method of improvement

a saturated solution of Syrup be used for this purpose

Sugar may be Considered a vegetable Oxyd

Take 100 of Starch 400 Water 6 of Acid Sulphuric digest for 12 hours, filter and evaporate and leave it alone, and it will harden.

Carbon. Supposed to be converted into *Sugar* in the process of *Malting.*

Sugar,—the produce of the *Arundo Saccharifera* or *Sugar Cane, Sugar Maple, Beet, Carrot, Grape,* and many other vegetables.—When purified, of a white colour, sweet, inodorous, not subject to alteration *by exposure to Air*; *very soluble* in water, and *crystallizable*; soluble also in *Alcohol,* but not in so large a proportion.—Readily decomposed both by the *Sulphuric* and *Nitric Acids*; in the *weaker Acids* merely soluble.—Forms with *Potash* a bitter astringent compound, insoluble in *Alcohol*; forms a similar one with *Lime.* On decomposition by heat yields *Water, Carbonic Acid, Carbonated Hydrogen Gas, Empyreumatic Oil, Acetous Acid,* and *Charcoal.*—100 parts consist, according to *Lavoisier,* of 64 *Oxygen,* 28 *Carbon,* and 8 *Hydrogen.*

Animal Substances.

Yield in general, by analysis, more *Azote* than *Vegetables.*

Their principal constituent parts and productions are, *Fibrine, Albumen, Gelatine, Mu-*

cilage, Urea, Sugar, Oils, Resins, Sulphur, Phosphorus, Acids, Alkalies, Earths, Metals.

Those not already treated of are,

Fibrine,—commonly called coagulable lymph, is that which remains on washing the crassamentum of blood in successive portions of water, till it cease to give out any colour. Bears a strong resemblance to muscular fibre ; is white, tasteless, soft, ductile, elastic, insoluble either in *Water* or *Alcohol* ; in boiling water becomes hard and inelastic ; in its soft state much disposed to putrify; by long digestion in water is converted into a particular species of tallow.—Soluble in most of the *Acids,* and in the stronger solutions of both the *fixed Alkalies,* with which, by the assistance of heat, it forms a viscid bitter soap. In distillation yields a large proportion of *Ammonia.*

Albumen,—contained in the serum of blood, and in various other animal substances; most abundantly in white of egg. In its moist and fresh state is nearly without colour, taste or smell—viscid—readily soluble in cold water—distinguishable from other animal fluids by coagulating at a temperature of 165 *Farenh.*—*Acids* and *Alcohol* produce on it a similar effect. When coagulated is insoluble in water.—*Tan*

The presence of Azote in Animal Matter constitutes the difference between Animal and vegetable Compounds

Hence it happens that vegetable Matter is so liable to go into a Vinous fermentation and animal Matter into the putrefactive process.

Fibrine. If blood be removed from the body its homogeneous look is soon destroyed and separates

if this Coagulum be inclosed in a linen bag and exposed to a stream of water, it will become colorless

The Crassamentum is perfectly red.

The substance left after washing was formerly called Gluten but now it is called Fibrine

When the blood is inflamed the Crassamentum is covered with a Coat of Coagulable Lymph. The Cause of this Separation is unknown

the Fibrine appears to form only 3 parts in 100

When Dried it is a solid white substance tasteless and without smell insoluble in water and Alcohol when moistened and disposed to Putrefy. Unites with ye Alkalies and forms a kind of Soap.

The Liquid Separated from ye blood by Spontaneous decomposition is Commonly Called Serum but in chemical Language it is Called Albumen at a heat of 165 the fluid will become opaque and hard like the white of an egg. Albumen is Soluble in water and can be separated by Coagulation which is another striking character of Albumen. Alcohol and Acids and Several Metallic Salts will coagulate Albumen. a Solution of Hyd: Oxymuriat: is by far the most delicate test for Albumen. Dr Boston was ye 1st who found a Solution of Tannin slowly throws down from Albumen a yellow precipitate

Albumen is Soluble in Alkalies

A very Considerable exposed to Heat has the power of precipitating its of dissolving its Acid. Nit. evidently decomposes its: it not only prot... blood by according to Mr Hatchet's experiments it exists in Ligt Cartilage &c

its Specific Gravity is various in different Specim of its but in the greater number of Specimens Dr Marcet examined

If Albumen which has been coagulated by heat is cut a fluid is seen to exude from its which is called Serosity and which is not at all susceptible of Coagulation. - This was generally supposed to be Gelatine - but now its appears that its possesses none of the properties of Gelatine and that its resembles Mucus more than any other Substance

Consist of Muriate of Potash and Soda.

The whole of Saline contents of Serum of blood is 1 grain of Saline Matter to 100 parts of Serum 100 gr of Then Saline: 7 gr of Muriate of Soda 8 or 20 gr of Sod. Subcarb: 8 or 10 gr of Potass Sulph Phosphate of Lime Iron and Magnesia. The Sulphat of Potash is not found until it has undergone incineration

The Alkali found in State of Subcarbonate

The quantity of Animal Matter in Serum about
light when reduced to a dry brittle Mass.
The different Specific gravity of Serum does not
depend on variation in quantity of Salts, it depe-
ntirely on the Quantity of animal Matter or
Coloring Matter of ye blood, or that part
which may be washed off have been Called
the Red Globules, Consisting of Albumen unit
with Iron in a State of Subphosphate & this gives it red Color
Brande says the red Particles [illegible] its Contain a
greater portion of Iron than ye other Cons-
tituent parts of it, this Dr Marcet doubts

Gelatine or Jelly can't be considered as animal [illegible]
produced by Animal Substances
chiefly obtained from Skin by Tendons Cartilag
Ligts & Bon, when the Solution is allowed to
Cool it becomes tremulous - and is a
known in & when Deprived its watery
part driven off it is Called in [illegible]
the name of Glue. it is quite hard & Semitrans
this was long believed to exist in the blood Dr Bostock shewed sati-
sfactorily this is not the Case but it appears its the result of a Chemical pr
Gelatine is insoluble in Alcohol - but a
mixture of it with Water will partially dissolve it
a Solution of Isinglass in Gum produces a
very good Paste for making various vessels
but it will not bear heat. The Best test
for Gelatine is Tannin this is the best.
Dr Bostock says 1 Part of jelly in 5000 parts of Water may
detected with facility.

added to its aqueous solution, forms with it a copious yellow coloured tenacious precipitate, which, when dried, is brittle, and not susceptible of putrefaction.—*Albumen* soluble in *Alkalies* and *Alkaline Earths.*—In distillation yields the same products as *Fibrine*, but with a less proportion of *Ammonia. Tests* of the presence of *Albumen.* The fluid called *Serosity*, essentially different from *Albumen.*

Gelatine,—or Jelly, obtained by boiling certain animal substances, particularly skin, in common water, evaporating the decoction to the necessary degree of consistence, and allowing it to cool.—When pure, transparent and colourless. Soluble both in cold and hot water, very readily in the latter, even at a temperature of 90 *Farenh.* By drying becomes semi-transparent, hard, brittle, and of a vitreous fracture, *Glue.*—Is insoluble in *Alcohol; Alkalies* require the assistance of heat, but *Acids* dissolve it with great facility, even when diluted.—With *Tan* it forms, like *Albumen*, a yellowish coloured plastic compound, insoluble in water, and not susceptible of putrefaction; hence the theory of *Tanning.*—Heat decomposes it like other animal substances.

Mucus,—nature of this substance not yet well understood. Is distinguished by *negative* rather

It has been often confounded with Lymph
& is with difficulty distinguished from other animal substances.

than by positive chemical properties. When exposed to the action of a voltaic pile, gives out Alkali at one pole, and a coagulated substance at the other.

Urea,—procured from fresh *Urine* in the form of small crystalline plates, by evaporating it to the consistence of syrup, digesting this when cold in *Alcohol,* distilling the solution so as to separate and collect the spirit, and allowing the residuum to crystallize by cooling. Thus obtained, its colour is *yellowish white,* smell *alliaceous,* taste *strong* and *ammoniacal,* consistence *viscid,* extremely soluble in *Water,* somewhat less so in *Alcohol,* soluble also in the aqueous solutions of both the *Fixed Alkalies* and in *Marine Acid.*—By the *Sulphuric* and *Nitric Acids* it is decomposed, as it is likewise very easily by exposure to *heat,* even to that of boiling water. According to *Vauquelin,* 100 parts yield in distillation 92.02 *Carbonate* of *Ammonia,* 4.60 *Carbonated Hydrogen Gas,* and 3.22 *Charcoal.*

First known by French Chymists

Urea bears no resemblance to *Uric Acid,* a substance which constitutes the most common species of urinary calculus.—Conclusion of the Course.

THE END.

Perhaps there is no Substance that has been incorrectly defined as Mucus : it is now applied to a fluid secreted by a peculiar set of Glands to lubricate the Part to which it is applied as the Urethra &c are [illegible]
it in Alcohol soluble in Water.
Mr Brande has inferred that Mucus and Albumen are only modifications of the Same thing

much more acid is required to coagulate Albumen, than is required to neutralize the alkali which it Contains .

The fluid of the Nostrils is an instance & so they all consists of Mucus dissolved in Water - if you were evaporate a quantity of Tears you will have a Solid Substance , it Can't be precipitated by Tannin Coagulable (not) by Heat &c

Urea may be obtained by evaporating a quantity of Urine : until reduced to a thick Syrup when when allowed to cool Chrystallizes Confusedly

Obtained in this Method, it will chrystallize

4 Times its weight of alcohol will dissolve it when this is evaporated you will obtain Chrystalls of it
less Soluble in Alcohol than Water but the [illegible] Solution yields Chrystalls more readily than the watery when dissolved in Water in diff' proportions it has the property of giving the various smells of different kinds of urine - -

If urine be saturated with Muriat of Soda and the Solution chrystallized, it will not form its own regular chrystalls .

Pus then is no genuine test for it, it is a compound.—

(Dr Pearson distinguishes diff^t kinds of Pus but has not afforded a test for it)

Calculi are forming in the kidneys particularly in y^e Pelvis and Infundibula

The Symptoms indicating Calculus in the Kidney or in y^e Ureter going to y^e Bladder, are very much alike

Generally a considerable quantity of thick Mucus is discharged with y^e urine

The Presence of Stone in Bladder is principally indicated by a Pain at the end of ye Penis when the urine is flowing a free stream & will suddenly stop. There is also a continual inclination to make Water when the urine stops by the Stone stopping up the Passage & may be relieved by change of posture all these Symptoms are increased by exercise.

Stone in ye Ureter -

When in the Prostrate Gland it is sometimes giving rise to difficulty of passing ye Urine but Calculi may exist for a long time without giving rise to any urgent Symptoms.

The Symptoms of Calculus Concretions are in Women exciting Symptoms similar to those of ye Male.

We are indebted to Scheele for ye discovery of the part of Calculi Lithic Acid - and he conceived that all of them met with was Lythic Acid. Fourcroy Vauclay & have brought the State of improvement in the knowledge that we now possess -

Those found in the Kidneys are generally pure Lythic Calculi, on being cut thro they appear to be made up of various Lamellæ with a distinct Nucleus. But the Kidney has sometimes forming in its the Mulberry Calculus The Phosphate of Lime Triple Phosphate -

Calculus in the Bladder are formed by various means, sometimes they consist of fine particles cemented together by Mucus - any extraneous body getting into ye body will be liable to become a Nucleus of a Stone

They are sometimes becoming of [illegible]

the Shape and Color also vary considerably some of them are smooth & some rough some are white others Brown like the Color of Mahogany.

Lythic Acid is disting by being soluble in fixed Alkalies by applying gentle heat & and may be precipitated from the Solution by an Acid; if heated by blow Pipe its entirely destroyed emitting a peculiar Smell. If Nitric Acid is drop in it and heated to dryness a beautiful Crimson ~~white~~ Color is developed. which if you add a little water a Crimson Solution ~~pearl color~~ will be formed ~~imparted to it~~ when it is entirely dissolved — Lythic Acid is very Commonly met with in the Urinary Bladder but not in a State of Purity. this is most Commonly mets with with in bod

Oxalate of Lime or Mulberry Calculus

When Heated it smells like Semen.

Insoluble in Alkalies, difficulty in Acids

When urged by the Blow Pipe it swells and crackles — which is a test for it. The Oxalic Acid is burnt out by the heat and the Lime remains in its pure State & will turn Turmeric If its is finely Pulverized and by the applicati of heat is Soluble in Acids.

Phosphate of Lime is a Compact Structure Laminated and is radiated likewise which may be seen by Close examination & by Heat it remains unaltered excepting whitening it a little — Pure Phosphate of Lime is not acted upon by Heat soluble in acids &c

The Fusible Calculus, When heated converts a Globule Consists of an Ammoniacal: Magnesian Salt and Phosphate of Lime when these are separa they have peculiar properties — This Triple Salt when heat is applied emits an Ammoniacal Gas —

There is also found a Stone which Dr Wollaston has named Cystic Oxyde resembling very much the Lithic Acid — Solutions of Acids injected into ÿ Bladder has been tried but not with any good effect. — Opium has also been dissolved in ÿ same Solution to allay the irritation of ÿ Bladder — if used right the Patient should void for urine prior to ÿ injection being used.

A VIEW

OF THE

SIMPLE BODIES.*

CLASS I.

(Comprehending the Imponderable Agents, viz.)

Caloric, or Heat,
Light,
Electricity.

CLASS II.

(Comprehending the Agents capable of uniting with Inflammable Bodies, and in most instances of effecting their Combustion, viz.)

Sometimes the diff kinds of Calculi are alternated together. There is an unfortunate ...

Oxygen,
Oxy-muriatic Acid, or Chloric Gas.

CLASS III.

(Comprehending the Simple Combustible Bodies, or Bodies capable of combining both with Oxygen, and with Chloric Gas, viz.)

Hydrogen,......	or *basis of Water.*
Nitrogen, ...	*basis of Nitric Acid.*
Carbon.........	*basis of Carbonic Acid.*
Sulphur, ...	*basis of Sulphuric Acid.*
Phosphorus, ...	*basis of Phosphoric Acid.*
Boracium,......	*basis of Boracic Acid.*
Fluorium, ...	*basis of Fluoric Acid.*
Potassium, ...	*Metallic Bases of the Alkalies.*
Sodium,.........	
Ammonium,†	

Calcium,	Yttrium,	*Metallic Bases of the Earths.*
Magnium,	Glucium,	
Strontium,	Zirconium,	
Silicium,	Barium,	
Alumium,		

Platina,	Bismuth,	Molybdenum,	*Metals.*
Gold,	Nickel,	Titanium,	
Palladium,	Arsenic,	Tellurium,	
Silver,	Cobalt,	Chromium,	
Mercury,	Zinc,	Columbium,	
Lead,	Antimony,	Cerium,	
Copper,	Manganese,	Osmium,	
Iron,	Tungsten,	Iridium,	
Tin,	Uranium,	Rhodium.	

* By denominating bodies *Simple*, it is not meant to express that they are so in reality, but only that we are not able, by any chemical means with which we are acquainted, to decompose them into simpler parts.

† Ammonium is strongly suspected of being a compound ; but as its nature has not yet been positively ascertained, it may still be classed amongst the simple bodies. The same may be said of sulphur and phosphorus.

ERRATA.

Page vii, Preface, line 8, instead of the word *occasionally*, read *usually.*

Page 37, line 3, from the bottom, dele the words, *soluble also in Spirit (Spiritus Ammoniæ* P. L.)

Page 81, line 5, from the bottom, for *Wolfram*, read *Tungsten.*

Ibid. line 4, from the bottom, et passim, for *Chrome*, read *Chromium;* and after the word *Columbium*, add the words, *Cerium, Palladium, Osmium, Iridium*, and *Rhodium.*

Page 95, line 4, after the word *Quicksilver*, add, *or Calomel.*

Page 101, first line from the bottom, instead of *Cuprum Vitriol.*, read *Cupri Sulphas*, and add, *Triturated with Carbonat of Ammonia, forms the Cuprum Ammoniatum* P.L.

Page 108, lines 9 and 10, from the bottom, dele the words, *thrown into Muriatic Acid, burns with a blue flame.*

Page 119, line 8, from the bottom, for *præpartum*, read *præparatum.*

Page 135, at the end of the page, after the word *Charcoal,* add, *Mr. Hatchett's Artificial Tannin.*

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